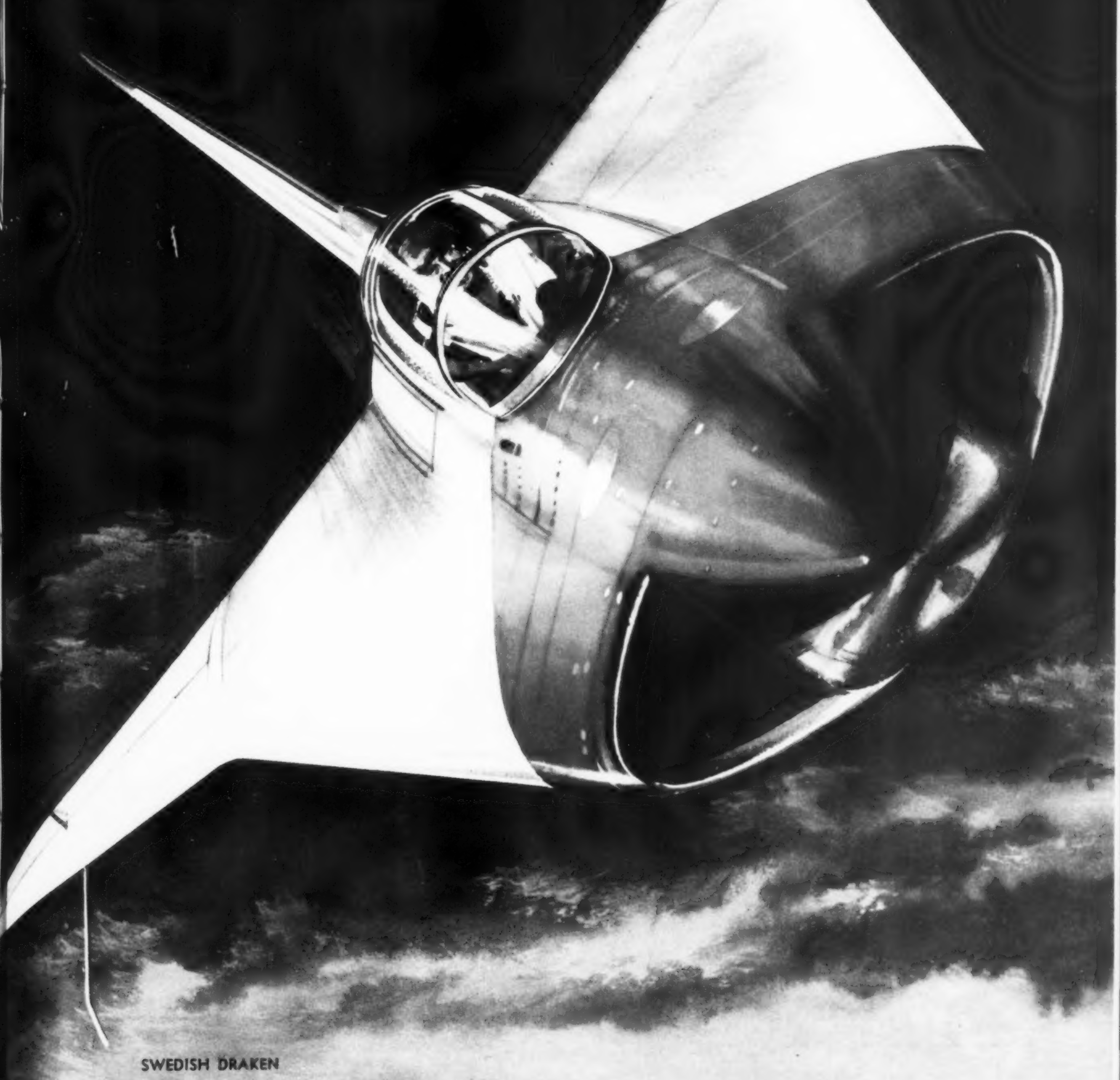
MODEL AIRPLANE NEWS

APRIL 1953 — 25 CENTS



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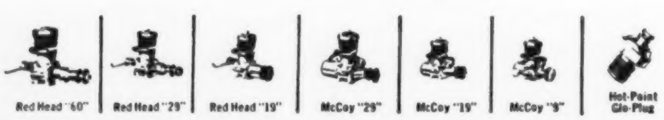

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APRIL 1953 Vol. XLVIII—No. 4

CONTENTS

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Contributing Editors: Peter Chinn (England), Joseph Nieto, Harry Williamson

Executive and Editorial Office:
551 Fifth Avenue, New York 17, N. Y.

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Editorial and Business offices: 551 Fifth Ave., New York 17, N. Y. Published monthly by Air Age, Inc., 1140 East West Highway, Silver Spring, Maryland. Jay P. Cleveland, President and Treasurer; Y. P. Johnson, Vice Pres.; G. E. Johnson, Sec. Entered as second class matter Feb. 1951 at the post office at Silver Spring, Md., under the act of March 3, 1879. Additional entry at New York, N. Y. Price 25c per copy in U. S. Subscription Rates — Within U. S. only: 1 yr. $2.50; 2 yrs. $4.75. In Canada: 1 yr. $3; 2 yrs. $5.75. All other parts of the world: 1 yr. $3.50; 2 yrs. $6.75. Change of Address — Send to MODEL AIRPLANE NEWS, Subscription Department, 551 Fifth Avenue, New York 17, New York, at least one month before the date of the issue with which it is to take effect. Send old address with the new, enclosing if possible your address label or copy. The Post Office will not forward copies unless you provide extra postage. Duplicate issues cannot be sent.

by William Winter

▶ When we sat down to this column five days ago, had wanted to talk about some of the special features—and guys—who helped make the April MAN a nice issue. But looking out upon the rare winter day —warm sun in a cloudless sky—could tell by the uptown wind sock that all over the east, modelers were moaning over it being a school or working day. This windsock (a blue flag with the word Squibb) is as rigid as a board on Saturdays and Sundays (so we understand) but is as limp as a rag on many weekdays. Then the phone rang and one thing led to another.

Bill Fletcher, one of the spark plugs of the Wakefield Committee, to confirm the news that the Wakefield will be held in England this year, at Cranfield, Bux., on August 1-3, tying in with the coronation. The really significant thing is that the Power Championship is being held at the same time, which means that each country will be sending a team of eight—four in the Wakefield, and four for the free flight shindig. A third event, based on Wakefield team placings, is part of the deal. Although the control line championships remain in Brussels, and the Nordic in Yugoslavia, this year a start has been made toward the "model Olympics." If the Nordic and control line are to be combined with these events in the future, depends on the support given the combination free flight and Wakefield finals in 1953.

In the U.S., the two four-man teams will be selected by a series of quarter finals and semi-finals as before. Except that one rubber man and one free flight man will be selected at each semi-finals and that, therefore, four such meets will be necessary instead of three, as heretofore. Langley Field, Oklahoma City, Detroit, and probably Sacramento, will be the locations. Entry fees of 50c, $1.50, and $3.00, depending on age, are expected to defray team traveling expenses to N. Y. Coast members travel further to New York, to "begin" their trip, than any European who goes to England. The industry doesn't know it yet—as this is written — that Matty "Pylon Brand" Sullivan is going to read them the patriotic riot act at the Model Industry Trade Show, held in Chicago. Nils Testor is said to have recommended super salesman Matty (who volunteered anyway) to the Wakefield boys. Since the Testor family visited at length in Sweden last year and got to see our boys fight for the trophy, it cannot be said that the industry is deaf to our needs. And let's never forget that it was Jim Walker who dug deep for $5,000 to send the boys to Finland in 1951.

One guy who will be shocked by the selection of Oklahoma City for a semi-finals is Ray Matthews, who gets this one in the neck, just like Conrad. About a month ago, Ray dropped in one Saturday to discuss rules changes. A fat brief case full of do's and don'ts eloquently proved that getting mixed up with a rules committee is like facing a firing squad. Anyway, it seems that Ray has opportunity in his CAA job to travel widely. He was thinking seriously — you know how modelers *(Continued on page 5)*

PLANE ON COVER—SAAB DRAKEN

As a "breather" in the series of historical plane covers, and to give the modern fans a break, Sweden's Saab Draken distinguishes this issue. The Draken Delta is a research craft. Its selection is fitting, for Sweden's aircraft industry enjoys extraordinary prestige. Next month, the Sopwith Camel will be featured. We invite readers to send us the names of their all-time favorites. Planes may be from any period in aviation history. Future subjects will be picked accordingly.


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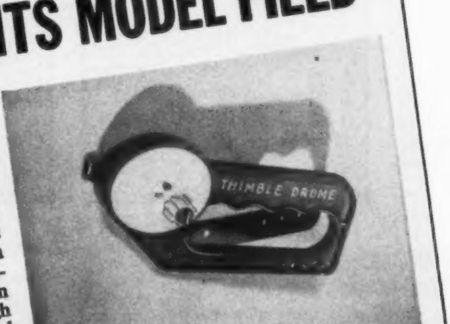
THIMBLE DROME

Man at Work . . . .

(Continued from page 2)

talk? — about going to Peru long enough to make their Wakefield team, then get sent to Sweden for the finals. Easier than going to the semi-finals, said Ray of Oklahoma City. He just moved to Florida! MAN at Work also feels like Conrad. Last month, said we didn't think the old style eliminations would be best if other events were combined with the Wakefield to select a team for multi-event participation at any "model Olympics" abroad. We'd better reassure Bill Fletcher and the boys that MAN is behind them 100 percent!

* * *

Ted Clodius, New York *Daily Mirror*, with the startling news that the Mirror Meet is to be held August 30 at Floyd Bennett Naval Air Station, Brooklyn, instead of Grumman airfield at Bethpage, L. I. Grumman can't shut down the field even for one day this year, turning out fighters like mad for our friend, the Navy, so we'll take the change in stride. Floyd Bennett is a big base but, if wandering free flights do get over water, team of boats and helicopters will go to the rescue. At least no brats can hide the errant model (Bethpage poppa's, please note) in their cellars. The Mirror is adding a hand-launched glider event for 8 to 13 year olds.

* * *

Dallas Sherman blew in from Tokyo with tales of Japanese modeling. Juan Trippe's assistant in the Orient, Dallas never forgets he was a modeler. In New York, PAA's George Gardener makes an obliging and interested contact between idea man Sherman and, through the editors, the stateside modelers. An interesting sidelight to Japanese activity is the amazing, if not monumental, research reports submitted to MAN. It would take an entire issue to publish some of these reports, which is why you don't see them. But believe us, Japanese design is at a very high level. Unfortunately for Dallas, he isn't in the states long enough to take a hand in contest activities but he sure makes up for it in Japan. One recent contest was an overwater free flight distance affair. Flown with prevailing winds from an island five miles offshore. Enthusiasm was terrific. On the mainland, 250 observers, equipped with telescopes, stationed themselves up and down the shore. One plane barely reached the beach to win the contest. One luckless chap fell in the drink within feet of shore. Many others went sailing overhead too high for the numerals to be recorded by the judges, despite telescopes. So they disqualified the high flying models.

* * *

Somewhere in the "lost weekend" of modeling, drifted into Bill Johnke's. Modelers were stacked like cord wood in the basement. One guy was running trains and fouling up the job at that. Someone was pushing, then steering, an rc fuselage with controllable tail wheel. In one corner, three hams were having a bad time with a receiver. Hatschek and Quermann dropped in for a chat on proposed flying scale rules. Flash bulbs were popping off. The arrival of assorted wives failed to break off the session. Once Larry "Control Master" Walker and a battalion of modelers took off down the street for a ground check of his new hard tube receiver. All that was needed was a base drum. The Johnkes undoubtedly acquired new distinction in the neighborhood. Please, wind, don't blow next weekend!

* * *

Bill Effinger on the phone about the flap and rudder tie-in on their new Helioplane kit for rc. Had bumped into Bill and Don McGovern on the field at Hicksville. Don was flying a gas powered helicopter and Bill was making movies. Mr. Berkeley was heard to mutter, "Ah, this years it's helicopters," a remark with fascinating implications. It's been a long time catching up with us, but Bill is a wild man with ideas. McGovern is putting together for him a 25-foot Chris Craft which has a flush carrier type deck for the launching of models on Long Island Sound. Both boys have been spending an uncommon amount of time at sea, chasing pontoon jobs. Come swimming weather and MAN at Work knows of a good assignment!

* * *

Pleasing everybody in one issue is a manifest impossibility. Take u-control. Half-A sheet jobs drive the big engine boys nutz. To the kid with a hot Half-A and no place to go, a big *Zilch* on long lines is something he needs like a hole in the head. And just as MAN mixes the U-control types, scale, stunt, trainer, and novelty, the same has to be done with free flight. When does the rubber man get a break, and so on? Beginning with this issue, you'll find a greater variety of both plans and features, prepared by the top men in the business. Engine Review, for example, traditionally is a roundup of pertinent facts having to do with new engines. Some months ago, beginning with the two-speed K & B, arranged with one of the world's acknowledged authorities on engine design, Ted Martin, to exhaustively test and comment on, not only new engines, but others in general use. Ted designed the British AMCO diesels, reputedly the acme of all diesels, and recently moved to Canada. Now MAN has a new problem: how to keep U.S. manufacturers from hiring Ted away. Cross your fingers. Williamson's bipe, Carl Goldberg's article, Ray Matthews' article, Hofmeister's Wakefield, speak for themselves but we'd like to tell you the story behind another feature, "Flying Circus."

During the running of the F.A.I. record attempts at the Plymouth Internats in Detroit, MAN at Work was viewing the proceedings, with checkers checking models and other checkers checking checkers—from under the cool shade of a beach umbrella—when the far side of the field erupted into a terrific din of snarling engines, whirling and diving ships. About five of the fastest stunters—they flew like Grish B jobs with Barnstormer wings—were diving and zooming at the tail of a big gold colored crate dragging a streamer. The Barnstormers had teed off on their spectacular exhibition. For 90 minutes, we watched this wild but precise showmanship. Picture five compact stunters with Atwood 60's in the nose, in a long chase combining the features of team race with combat, and you'll get the idea. But there was no end of ships and events. Asked Walt Stevenson on the spot if he would tell readers about the act, the ships, and how it was done. Having especially watched Walt make what seemed 90 degree pullouts at 90 mph inches off the ground, could well believe stories about his having to get someone to drive him home after each show. He was ringing wet and shaking. Heck, so were we.

* * *

The thousands of builders who make Drakes from Ken Willard's plans in the Nov. 51 issue will be reassured by this testimony as to the floatation qualities of the little critter.

"I am a senior at Brooklyn Technical High School studying Aeronautics and I am an ardent model builder. I have found your magazine more interesting each month and I build many ships from your full size plans. One particular ship, the *Drake*, which appeared some months ago, has given me months of enjoyable flights without so much as a broken prop.

"Last Saturday, I went flying with my *Drake* at Breezy Point. The beach is a few miles wide so I assumed that a 20-second engine run would be safe. After a 20-second run on the first flight, the ship practically landed in my hands.

"Well, all modelers make mistakes now and then, and I made one on the second flight. I forgot to remove the tubing from the tank before launching!

"After about two minutes that seemed like a few hours, the engine (a Wasp .049) finally quit. By this time, the ship was directly over the deep, dark Atlantic about two miles offshore. After slowly gliding down, it made a perfect landing but the tide was going out and there was an offshore wind so the ship kept getting further and further out. I waited around for about a half hour and then gave up, thinking I had seen the last of the *Drake*.

"Imagine my surprise when I got a call Sunday night from a commercial fisherman in Long Beach, New Jersey! He had fished the

(Continued on page 8)

Man at Work

(Continued from page 5)

ship up out of the deep and, seeing my phone number on it, was kind enough to notify me. We should have more people like this in the world!"

* * *

Bob Davis, Toledo's energetic dealer (PALS, Jan. '53 issue), believes used motors have possibilities. *Wasps* and Ohlssons for $2.95, Bob brought along a crowd of beginners who started with Winston Smith's fishpole, *Lil Stunter*. Since many kids can't afford a motor, Bob's doing a good thing . . . From the Los Angeles *Times*, in describing Pasadena *Aero Modelers Association:* "They fly whiz-bang fighter planes controlled by wires and radio models that soar to the ends of vision." That's rc, alrighty! . . . Latest report on Ken Willard's allergy to fuel and cement: was vitamin pills . . . Pete Chinn using 1,500 foot line on rc towliner—and you can't get that Nordic overhead on 328 feet? He tows at 25 mph. Uses a station wagon and winch. Radio rig comes in at 150 pounds with soldering iron. "My friend, Davey, likes to be fully equipped," reports Chinn . . . Ralph Kummer, ole St. Louis indoor man, now edits Hiller *Helicopter News* in Palo Alto. Hiller would like to sponsor a helicopter, or "animated palm tree" event at the Nats.

We See by the Club Papers:

South Africa was a hot bed of modeling, we knew, but now a Nationals in Rhodesia, according to *Flypaper*, the official organ of the S. A. *Model Airplane Association*. Over three day weekend "Rhodes and Founders Day," for glider, C.2, free flight, speed, stunt, rubber, Jetex and a marathon deal for all free flight classes. *Flypaper* printed control line endurance "rules," and, in case you are interested, planes exceeding five pounds use .020 minimum diameter wires; not less than 25 feet or more than 70 feet long. About a 1,000 laps on 25 feet should straighten you out.

* * *

Credit the Salem, Oregon *Sky Cats* (*Sky Cats Tale Twister*, Don Santee, 970 Mill Street) for novel lost plane recovery scheme. Descriptions published in the paper which is mailed to all clubs in Pacific Northwest. Works, too. Five jobs recovered for their owners.

* * *

Flypaper, Bucks County, Pa., (*Federation of Model Airplane Clubs*, 1031 Pond St., Bristol), has grape vine column. Some of the grapes: free flight *Space Bug* this spring, a Fox 19, *Spitfire* .09 and .19. Quotes *Model Aviation* (AMA) which reminds us, too, of report from Massachusetts Institute of Technology stating 5/6" of drag of speed job at 150 mph is in the lines; D engine must develop 1-1/2" brake hp to hit 160 mph at 80% prop efficiency. Without the lines, speed could jump to 308 mph. Hate to get in front of one on the loose! One .024 line may boost speed 10 to 15 mph in D.

* * *

World's bravest correspondent makes with the answers in *Exhaust Gas*, Louisville *Model Club* (sorry, no address). Bill Given will pay $5.00 to any *Exhaust Gas* reader who stumps him. Sample: A hotter engine—open up the intake to 182 degrees; red hot mill for speed, intake should open 43 degrees before bottom dead center and close 49 degrees after top dead center. Open up the valve to largest diameter within reason. This should be done gradually, with in-between flights for rpm checks. Given would come in handy around here.

* * *

First District I meeting in history, was held at end of year in Hotel Shereton, Worcester, Mass., according to CCAMA News—circulation: "considerable." (Mike Adajian, 39 Brooklawn St., New Britain, Conn.). Warren Bartlett, from Detroit, among guests, spoke of Plymouth's future plans for the modeling field. New rules were "discussed." And how! District I includes the six New England states, natch.

(Continued on page 51)

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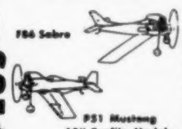

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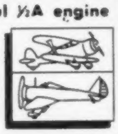

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Kit G-17

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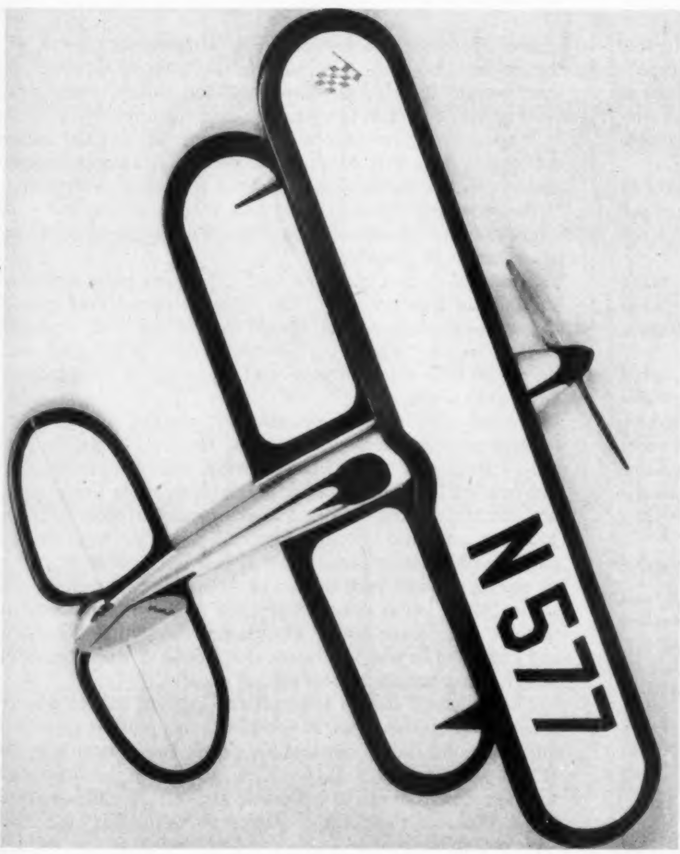
hot foot

Attractive lines of Harry's bipe represent the type of full-size ship he would like to own — and who wouldn't! Wing area of model is 500 sq. in.



Finished in cream with red trim, this highly maneuverable biplane for 32's to "sixties" solves all the "two winger" problems and is stunting fool to boot.

by HARRY WILLIAMSON

▶ How many "bipes" have you seen at the stunt circle in recent years? It seems to us that they should be more in evidence, since a biplane is to aerobatics what ham is to eggs.

Why haven't they been more in evidence? Some of the boys, when questioned about this unnatural phenomena reply that "it's impossible to keep the upper wing glued on during a good wringing out." Others, that "it's too much work, building an extra wing, and only have one ship!" Well, maybe so, but whatever reasons others offer, it's all really worthwhile, in our opinion. Why not try it yourself and see if you don't agree?

Since there seems to be little to be done about adding new maneuvers to the stunt pattern and since the skill of most contestants is of the highest order, one of the few avenues of escape left from this monotony is the addition of stunt ships to these affairs that look and fly like full sized ships.

Our reply to this problem is the *Hot Foot!* This job can keep up with the best of the "table-winged" stunt ships so prevalent today.

The *Hot Foot* is an unequal span "bipe" with the generous gap and stagger necessary for top performance. The ship as presented here will accommodate .32 to .65 engines. Built in accórdance with drawings and instructions which follow, this job will perform equally well with one of the new, lightweight and red hot .35's or one of the .60's that have been gathering dust and rust on the workbench for a long time. Those with Atwood *Triumphs* can cheer up too.

Although originally designed for the Fox .59 as shown on drawings, the original ship has proven to be excellent when powered with an Atwood Model JH. Super Champ. Properly constructed and balanced, the *Hot Foot* is a potential winner at any contest and will hang together as well as any ship.

The span of upper wing is 39". The lower span is 32". Wing area, total, equals 500 sq. O.A. length

Big advantage of the biplane is small overall length necessary to get the tail where it belongs in relation to the wing, a fact which explains the popularity of biplanes for airshow work. Enjoying the same advantage, *Hot Foot* also can be converted, as per directions, to carrier work.

from the tip of the spinner to the end of the tail feathers is 28-3/8". Kinda stubby, you say. That's the beauty of a "Bipe". It doesn't take so doggoned much fuselage to get empennage where it belongs in relation to the wing. That's one reason why Rod Jocelyn, Betty Skelton and numerous other aerobatic pilots still fly them.

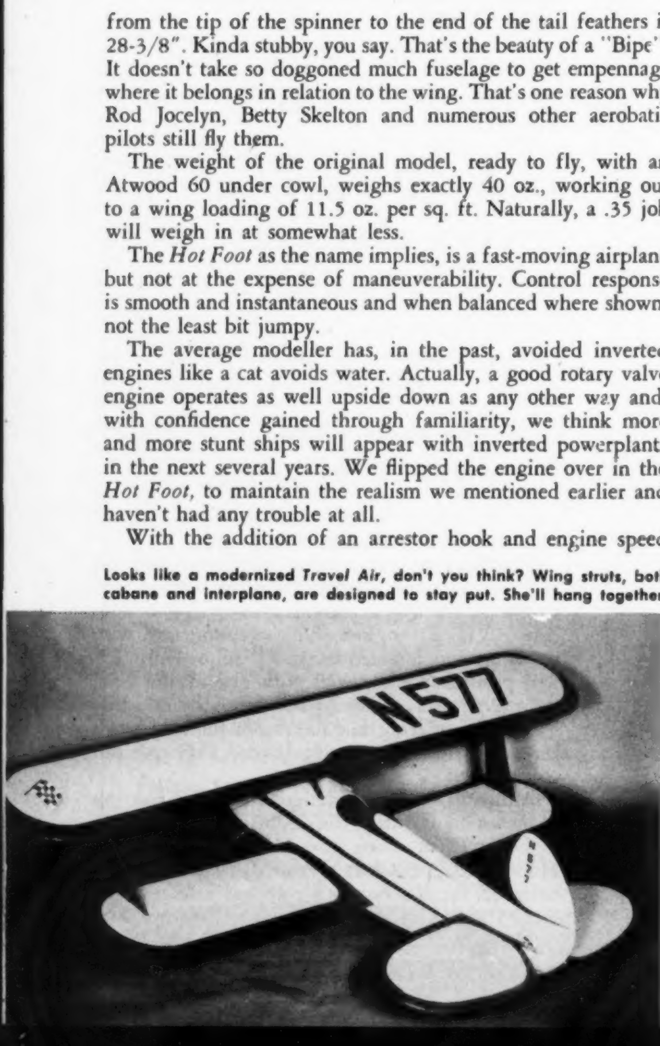
The weight of the original model, ready to fly, with an Atwood 60 under cowl, weighs exactly 40 oz., working out to a wing loading of 11.5 oz. per sq. ft. Naturally, a .35 job will weigh in at somewhat less.

The *Hot Foot* as the name implies, is a fast-moving airplane but not at the expense of maneuverability. Control response is smooth and instantaneous and when balanced where shown, not the least bit jumpy.

The average modeller has, in the past, avoided inverted engines like a cat avoids water. Actually, a good rotary valve engine operates as well upside down as any other way and, with confidence gained through familiarity, we think more and more stunt ships will appear with inverted powerplants in the next several years. We flipped the engine over in the *Hot Foot,* to maintain the realism we mentioned earlier and haven't had any trouble at all.

With the addition of an arrestor hook and engine speed control *Hot Foot* is a natural for a carrier event trainer. (If the model is built for this purpose, don't skimp on materials since weight is relatively important and should come in at close to 3-1/2 pounds for good landing qualities.)

Looks like a modernized *Travel Air*, don't you think? Wing struts, both cabane and interplane, are designed to stay put. She'll hang together.



A word of caution before starting construction! Determine the engine you will use and, if necessary, relocate engine mounts, so that thrust line will occur as shown on drawings. If this precaution is not taken, your version of the *Hot Foot* might not look like the drawings and will not permit cowling or engine to fit properly.

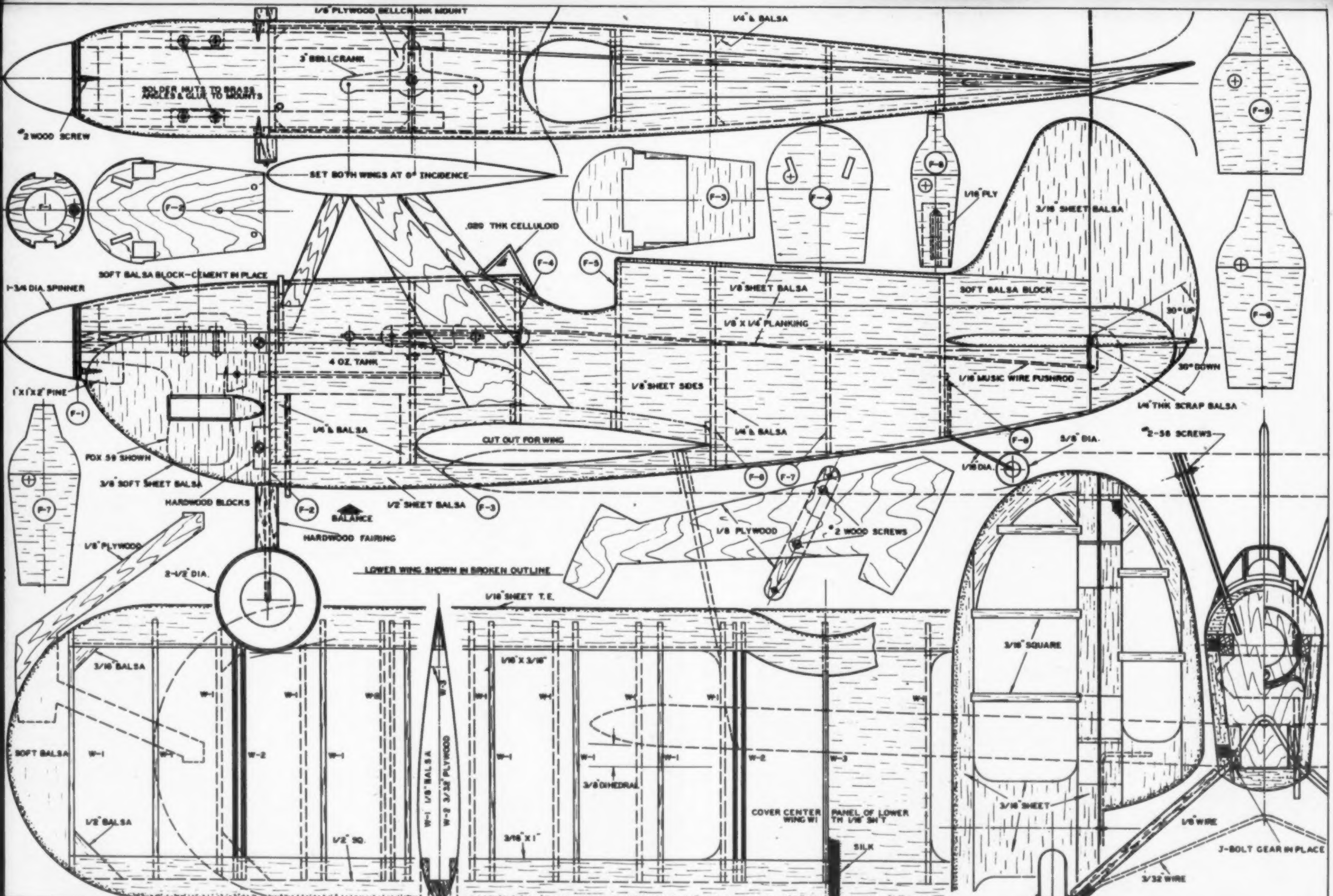
Select good, firm, medium hard 1/8" sheet balsa and trace and cut out fuselage sides. The 1/16" plywood doublers, as shown in shaded outline, should be cut out and cemented under pressure to each of the sides. Mark location of each former on both sides; do this carefully to insure correct alignment of fuselage.

Cut out all formers from material specified on drawings. Cement plywood firewall, F-2 balsa former F-4 to one side only. Lay this side down flat on workbench and, after these two formers are rigidly fixed in place, lay opposite side in place and cement securely in place, making certain both sides are square at front and top. Add former F-3 and work out toward tail, beginning with former F-5. If this job is done carefully, all parts should fit with ease and fuselage will be straight and square when job is done. Hardwood motor mounts that are straight and square should be inserted through F-2 and F-3 and cemented in place. Measure out from F-2 with a ruler or scale to make certain mounts project equally.

The bellcrank and its 1/8" plywood mount should now be fitted in between mounts. A good fit at this point is extremely important and should be carefully noted. Use cement liberally at this point; then run 1/16 dia. music wire pushrod through fuselage and connect to bellcrank and add flexible lead-out wires. We used a package of Perfect wires for this job.

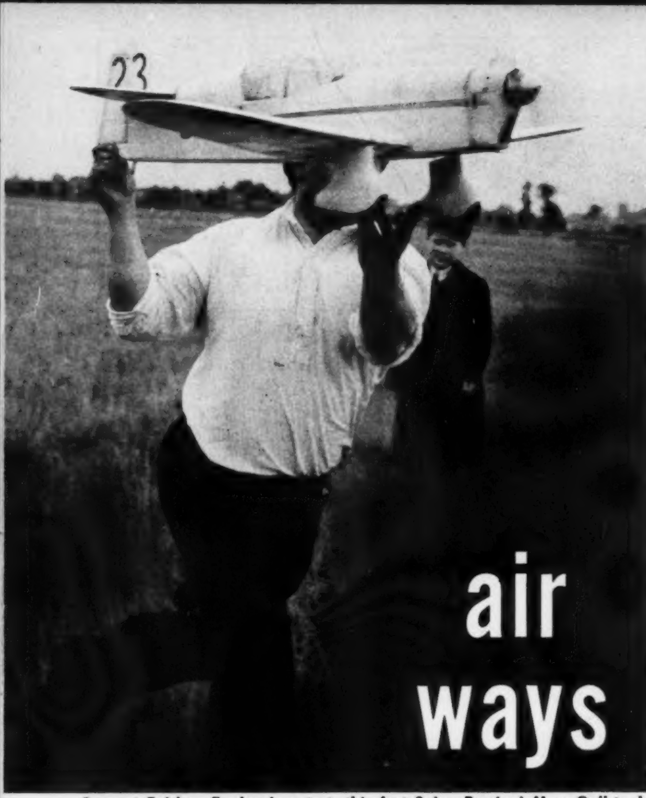
Select tank to be used (4 oz.) and mount in position, making certain that horizontal centerline of tank is level with spray bar of engine. Wedge tank in place between sides of fuselage and mounts, so it will not rattle or fall down. Add flexible plastic tubing to each vent, long enough to project about 1/4" beyond top and bottom of fuselage.

Bend landing gear directly over *(Continued on page 52)*



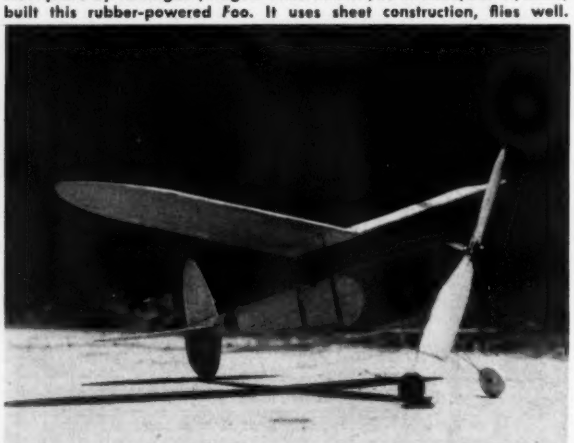
FULL SIZE PLANS FOR "HOT FOOT" AND "DOUBLE FEATURE" AVAILABLE. SEE PAGE 51.

air ways

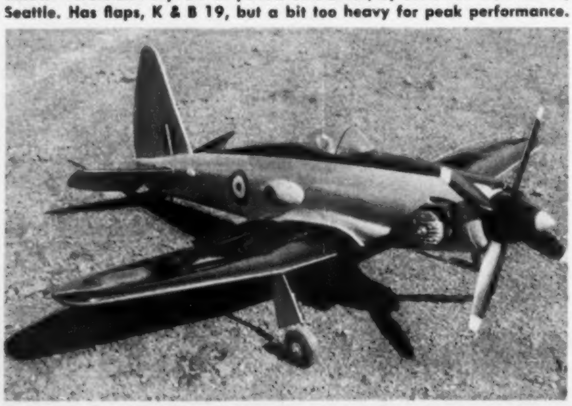


Seen at Fairlop, England contest, this fast flying Percival *Mew Gull* took some fast launching. Pendulum rudder control gave necessary control.

From plans by Ed Lidgard, August 1938 M.A.N., Ed Breland, Laurel, Miss., built this rubber-powered *Foo*. It uses sheet construction, flies well.



Below—Westland *Wyvern* in yellow and black, by scale fan W. R. Linke, Seattle. Has flaps, K & B 19, but a bit too heavy for peak performance.



Ever popular Berkeley *Brig* for rc, as built by Jerry Dickey, Kansas City, Mo., as a pay loader with O & R 23. In lower shot, ship deadsticks in.

Snapped by John Hutcheon, Hermosa Beach, Calif., an unidentified modeler's gayly colored W.W.I. Spad makes a pretty picture. Note pilot's scarf.

Below—High flying Fokker E-111, scaled up from Nieto plans (October '51 M.A.N.) has slightly enlarged stabilizer, increased dihedral. Cub .049.

Like these pix? Then let's have a look at that dream ship of yours!

Above—"CQ" rc, constructed from M.A.N. plans, Owen Black, Sacramento; picture by G. Stafford.

Above—Meet Violet Hoyt, San Diego *Airliners*, and her Dynajet speedster. Violet beat out boys at Nats.

Billy Edwards, Pinetops, N. C., checks out his Veco '31 powered Guillow *Barnstormer*. The *Barnstormer* is typical of the stunt model kits that have proved popular for expert and beginner.

Below — Beautiful, white *SE-5*, by David Oakes, Clinton, Ontario, does about 60 mph on O & R 23.

Below—*Air Whirlers*, Evansville, Ind. Back row, L to R—R. Wildman, B. Grable, J. Bastion, B. Foster, W. Foster, R. Brale, L. McLaughlin, L. Weaver, R. Clemens, Red Fisher, D. Bean. Front—D. Schimike, E. Brooks, J. Boors, W. Kleinhans, K. Ballard, T. Schneider, R. Dean, L. Duncan.

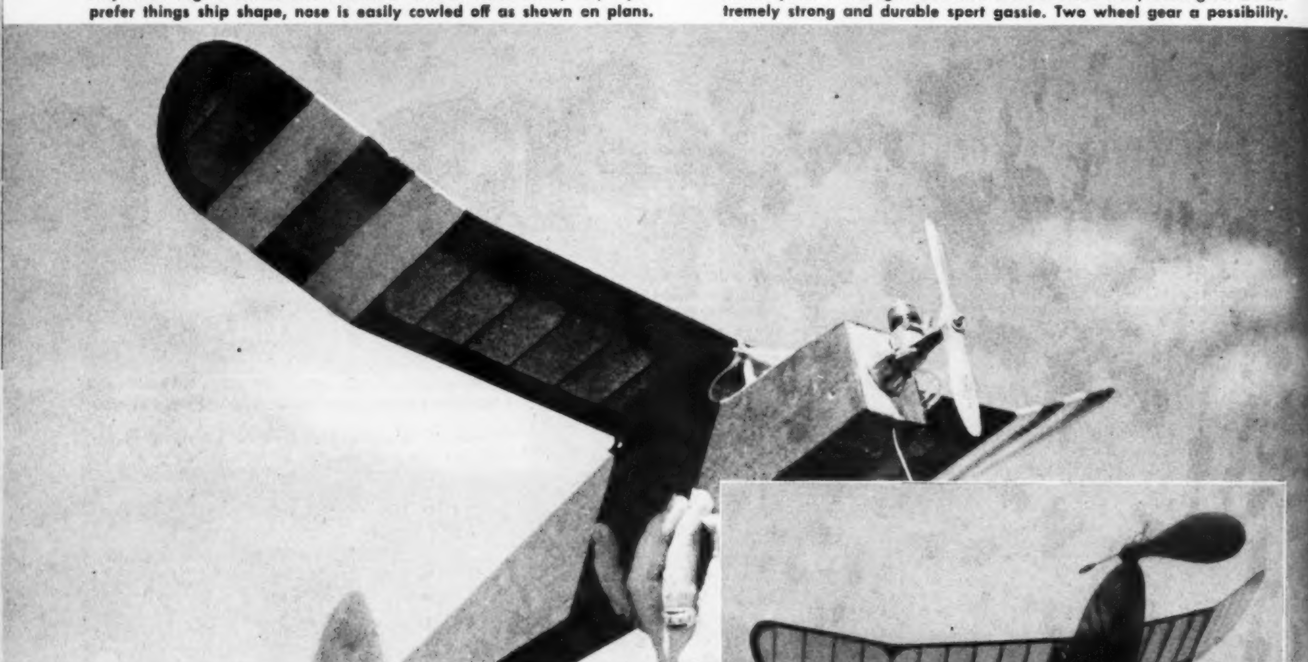
Double Feature

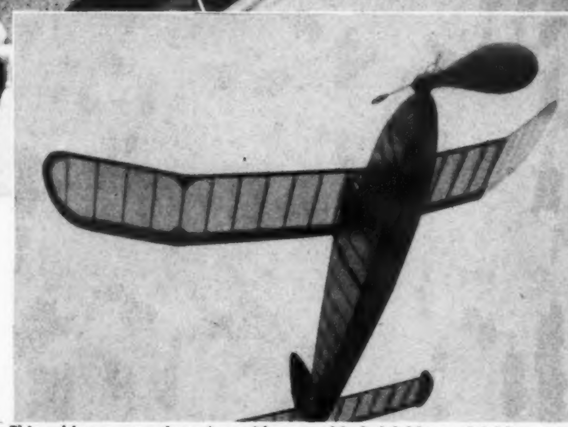
This sport type rubber job is good enough to win contests. And, with a few simple changes, it makes up as a mighty rugged gassie for Half A engine. Cheap to build.

by PAUL DEL GATTO

Any small engine can be mounted on a "built-in head wind," or, if you prefer things ship shape, nose is easily cowled off as shown on plans.

In this picture fuselage sides have been sheeted over, making for an extremely strong and durable sport gassie. Two wheel gear a possibility.





This rubber-powered version with a one-bladed folder and folding gear helped author take high points at eastern contest. Ship is very stable.

▶ In both rubber and gas powered, the *Double Feature* has garnered many first, second and third places. It combines performance with simplicity of construction and adjusting, and is adaptable for either rubber or gas power with a minimum of changes.

Simplicity in adjusting and consistency of performance are the reasons why we use this design for testing ideas or proving theories. One test was with folding and freewheeling propellers. (Dec. '51 issue of M.A.N.) At present, the gas version is fitted with experimental floats.

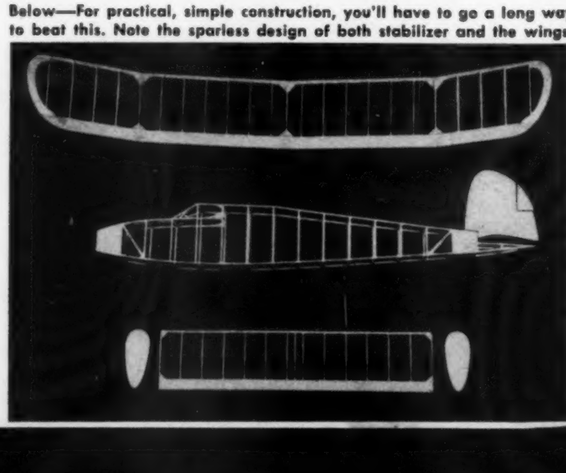
Whether you construct the gas or rubber version, the basic construction features of the fuselage remain unaltered. However, in laying out the two sides of the body, remember that the first two stations are deleted for the gas version.

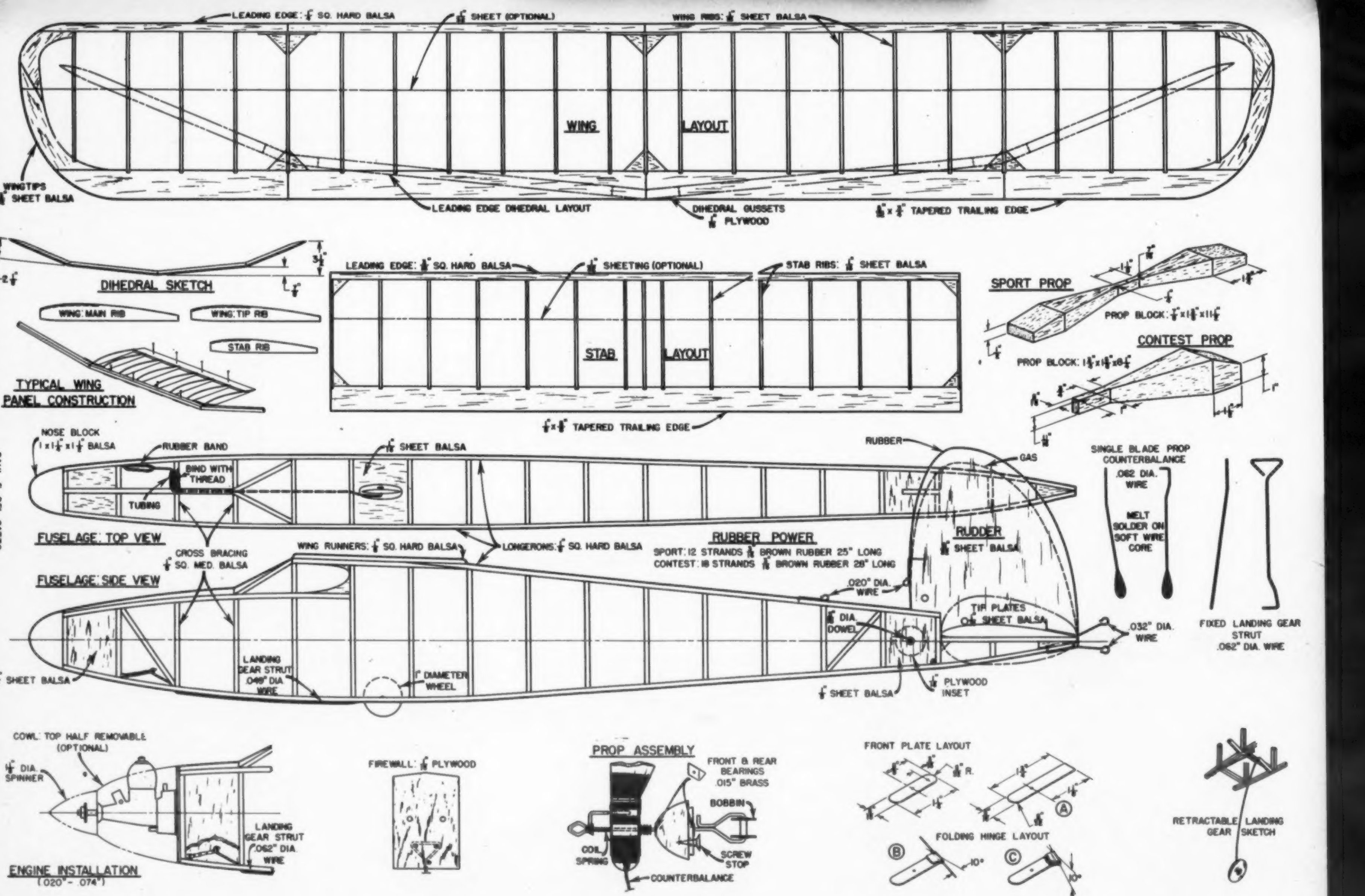
Use hard 1/8" sq. balsa for longerons and medium 1/8" sq. balsa for crossbraces to construct both sides of fuselage—super-imposing one side on top of the other. Allow sufficient time for cement to dry to prevent sides from springing out of alignment when removed from plan and separated.

The easiest way to join the sides is in the middle first. Then join the two ends and, once thoroughly dry, cement remainder of crossbraces in position.

Cut out firewall (for gas only) or bend landing gear to shape. The single strut landing gear is bent from .062" dia. music wire for gas or .049" (*Continued on page* 48)

Below—For practical, simple construction, you'll have to go a long way to beat this. Note the sparless design of both stabilizer and the wings.





PAUL E. DEL GATTO

FULL SIZE PLANS FOR "HOT FOOT" AND "DOUBLE FEATURE" AVAILABLE. SEE PAGE 51.

For 15 years Center of Lateral Area arguments made the Hatfield-McCoy feud seem a tea party. And now an authority says the theory is hokum.

(Some years ago, CLA was the subject of a famous debate between Carl Goldberg and your editor. Recently, M.A.N. received this manuscript. As editor, Bill Winter prefers not to argue the subject with friend Carl, but feels that the excerpts from correspondence between the two relating to this manuscript will shed added light on a complex subject. Readers who have pro and con opinions are encouraged to express them—Publisher).

Editor — . . . what I think about this arbitrary subject after five years: if a center of lateral area does exist, it would seem to have no bearing on free flight in which warps, adjustments, torque, and slip stream make most other factors inconsequential. As we both know, if a free flight spirals in, it is more apt to be due to a misplaced tab, the changes in props, the warp or anyone of the many elements. Basically, I think this whole question originates from someone having complicated a very simple thing, which is, if I may coin a new term, the center of weathercock area. If the center of the side area of a plane was not sufficiently far enough behind the CG, the plane would have no directional stability. There certainly is no argument on this point.

If such a center does exist, it follows that its vertical location, even if we can't satisfactorily determine it, can vary at random according to the design being high, low or somewhere in between. If the position of this center must be behind the CG to determine whether or not there is dirctional stability, its position in a vertical sense might be a factor in the plane's performance. However, this comes back to the original point which would be the effect of the center if it subjects the profile of the machine to the air stream. I think, therefore, that CLA is simply the plain ordinary center of side area which determines the amount of directional stability.

I refer only to free flight, about which the original discussions took place.

Goldberg—Agree with your remarks on CLA. Years ago — around 1935—Raymond Dowd's articles on models in Aero Digest called it Directional Center. It is principally this; however, when above CG it acts to increase lateral stability, and when below, it tries to turn the ship over. If I recall correctly, Dowd likewise brought out this relation.

Editor—Apropos of Dowd's articles and the busines of a high directional center increasing lateral stability, it would seem directly oposite to ....'s theory. I did interpret your comment correctly?

Goldberg—As I remember it, Dowd would not have agreed with.................................. .

by Carl Goldberg

Now that free flight is coming back strongly, it's time to speak frankly about a certain mysterious factor in model design. This is known as the theory of low center of lateral area of CLA.

Let's get down to brass tacks. This theory has been accepted by some people because it sounds so scientific; the truth is that if any model ever really did incorporate the idea behind low CLA, it would not be able to fly in ordinary free flight.

What is the idea behind low CLA? Just this: take the side view of an airplane, and balance *(Continued on page 48)*

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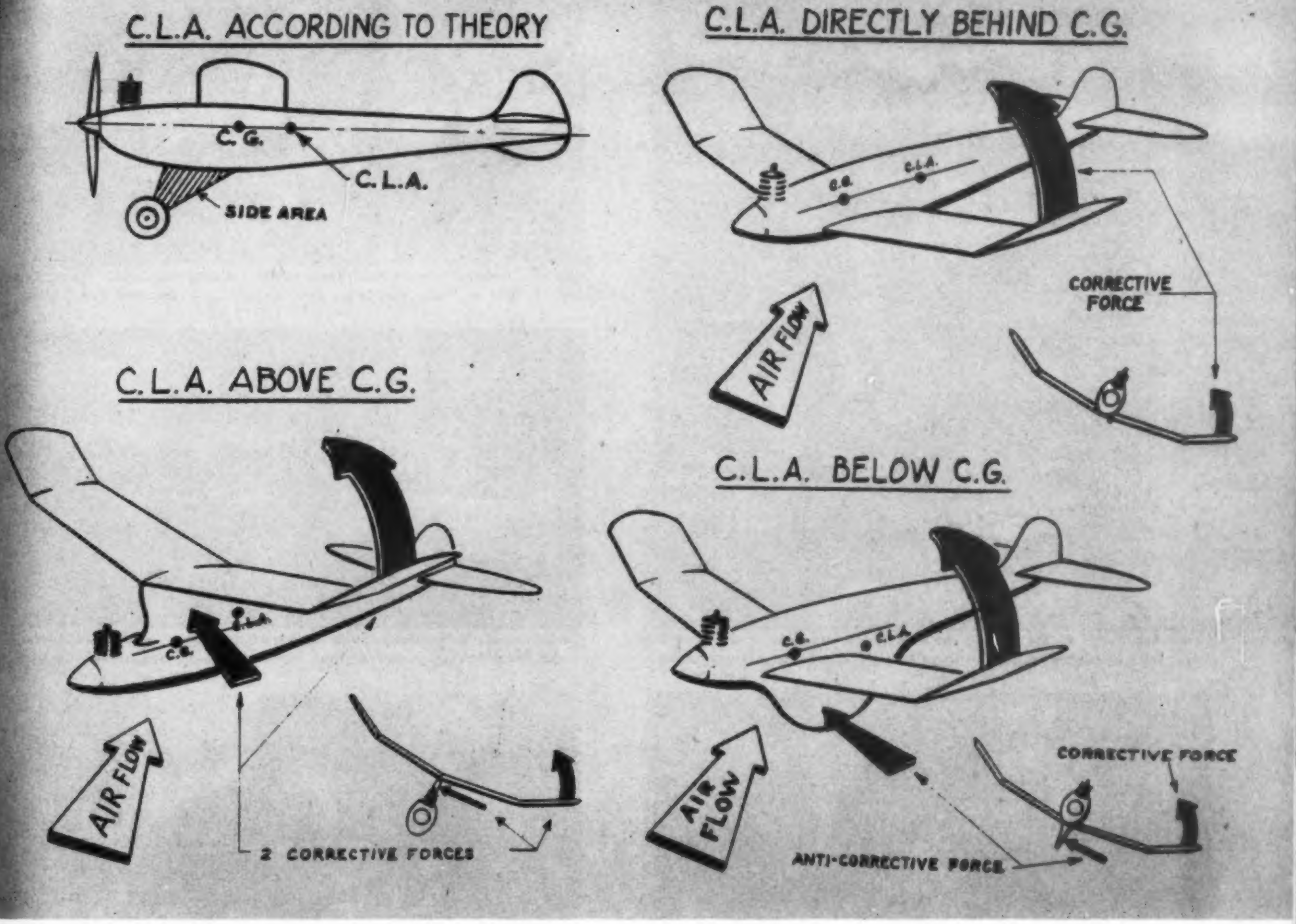
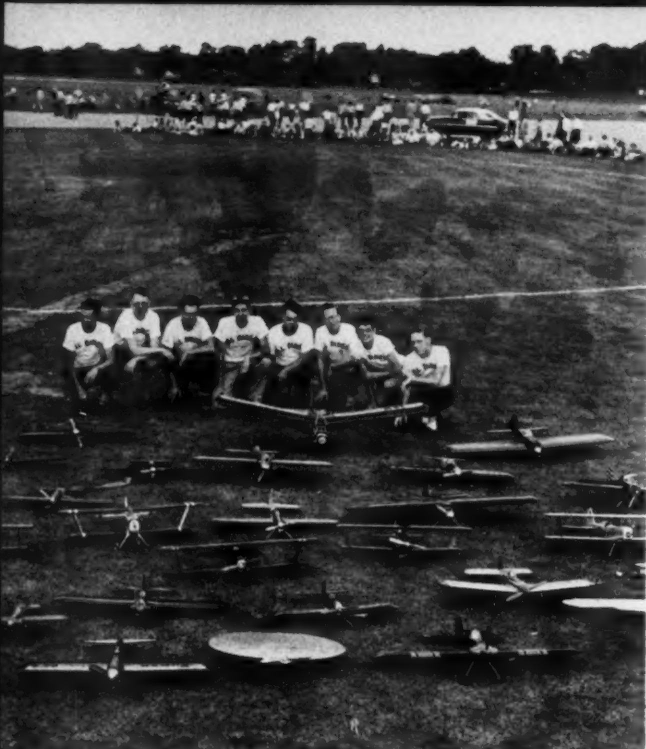


The Truth About C.L.A.

Below—"Low CLA" boys are given to deep bellied fuselages, cabins, while opposite, pylons (Goldberg designed *Zipper*) are considered "high CLA." Arguments go back to KG. Remember?



About two-thirds of the Circus, showing the amazing diversification of types, from the flying saucer—a favorite with crowd—to rc, background.

The 60-powered biplane team racer event is a spectacular act. The pilots, left to right — Walt Stevenson, Jim Losie, E. J. Losie, and Ken Taylor.

Curtain raiser of the show is the towing of a banner. Four hot ships later make breathtaking passes at the "bomber," sometimes nibble flippers.

Beautiful performer is this man-sized *DC-3* built by Bud Baud. One rule of the Circus is that ships must look good, not like overnight wonders.

Fairchild *C-119* has its four man crew in the cockpit. Powered by two Fox 35's, the big ship is capable of stunting, lays smoke screens.

Many special types of planes, like this autogyro, draw spectator interest Warren Bartlett, of Plymouth Internationals, is cranking the engine.

Stevenson, left, and Jim Losie get set for a little ribbon cutting. Main acts feature Atwood 60's, are flown at high speeds. Show is fast moving.

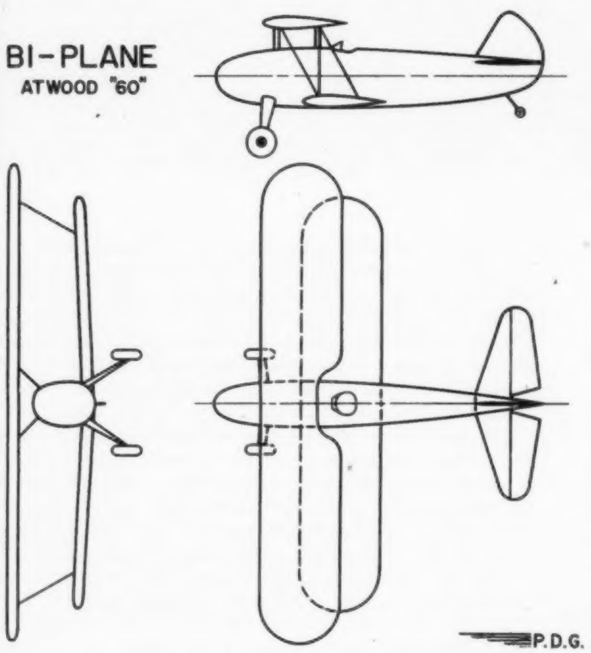
Flying Circus

by Walt Stevenson

▼

Spectators love the most exciting of all model shows.

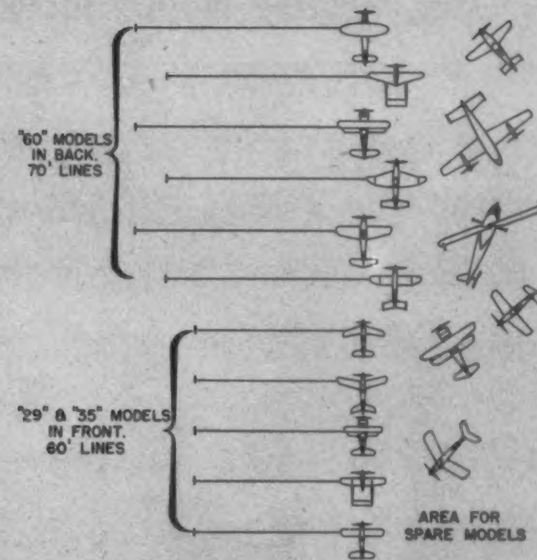
BI-PLANE
ATWOOD "60"

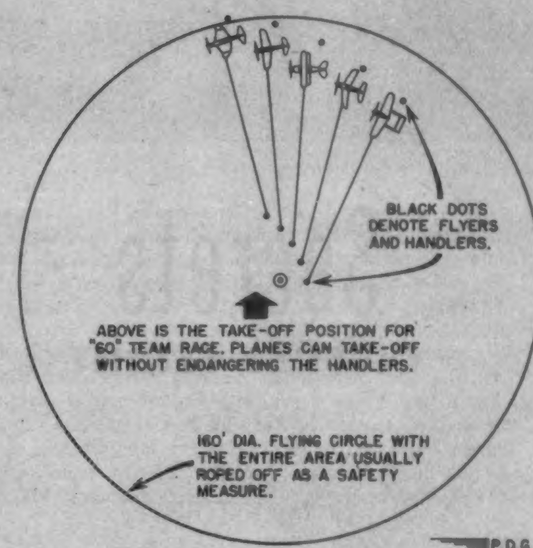


▸ At one of our Sunday flying sessions in 1947 — two ships were put in the air at the same time. Needless to say, we didn't take these ships home that night, but we knew that with a little more practice it could be done successfully. Soon we started flying with three, then four, and finally five .60 biplanes in a team race that required two refueling stops. So much spectator interest was created everytime we flew, that it was decided to include new types of planes and added several other single flights, such as twin-engine scale jobs, combat, smoke screen, glider pick-up, dual stunting. That was the beginning of the *Barnstormers Model Air Circus.*

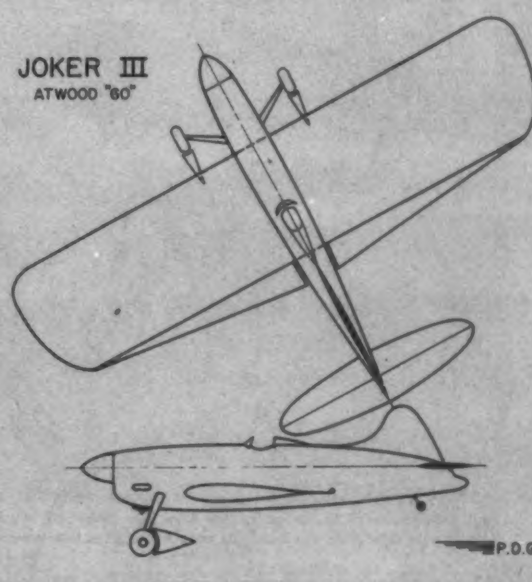
In the last four years, we have put on over 25 exhibitions, which included over 460 flights, in and around Detroit, at the Air Fair, model contests, boys' schools, stock car races, Internationals, etc. The shows last anywhere from one-half hour to two and a half hours, depending on the facilities and conditions. Weather conditions sometimes limit how many ships can be put in the air *safely.* Only twice in 25 exhibitions was the wind calm; once it was 42 mph.

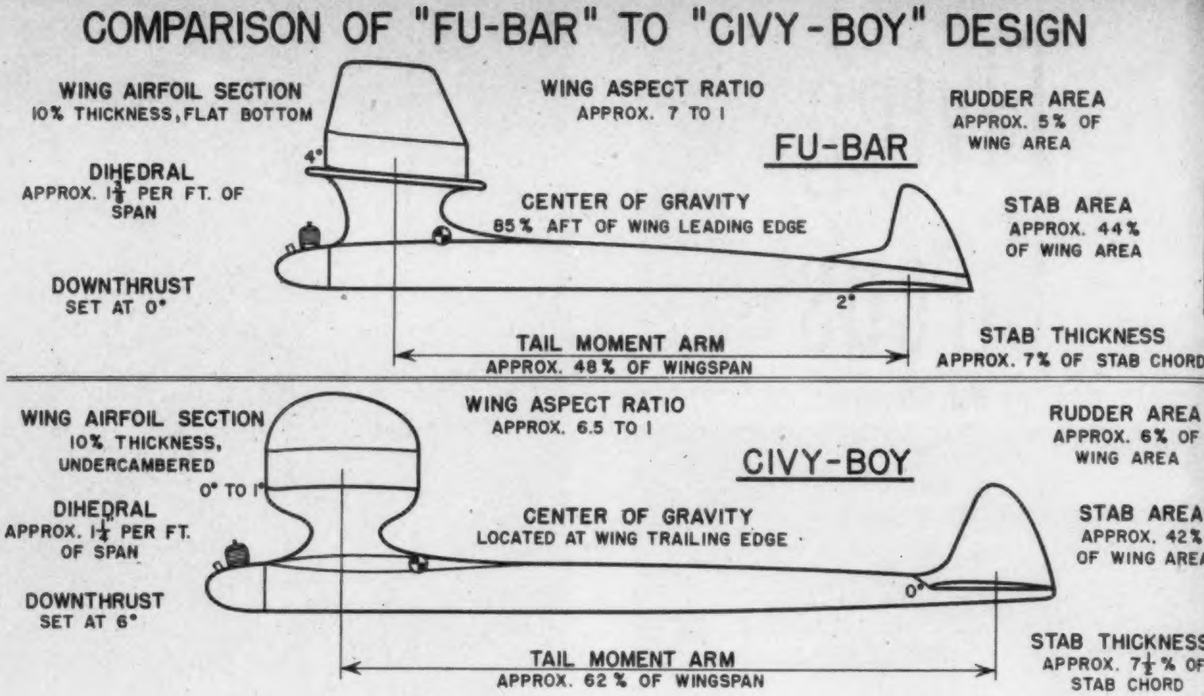
The circus now includes (*Continued on page* 54)





JOKER III
ATWOOD "60"



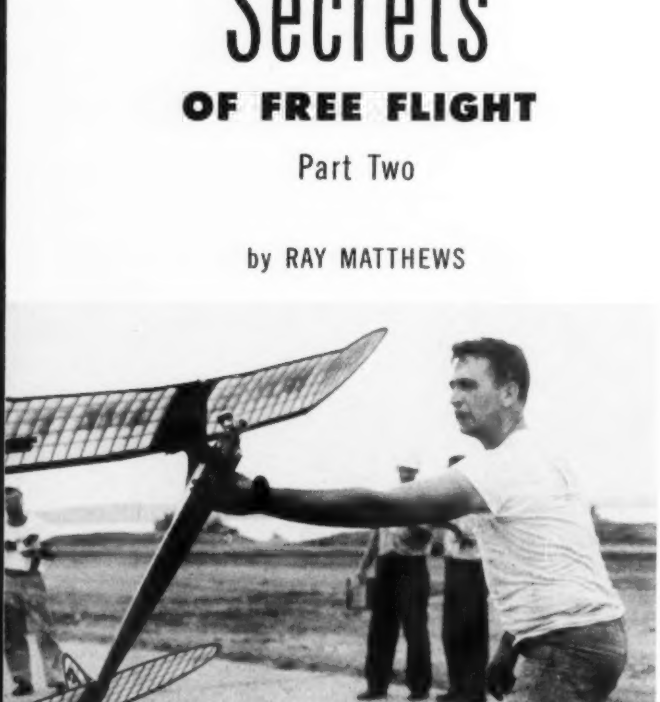


Secrets

OF FREE FLIGHT

Part Two

by RAY MATTHEWS



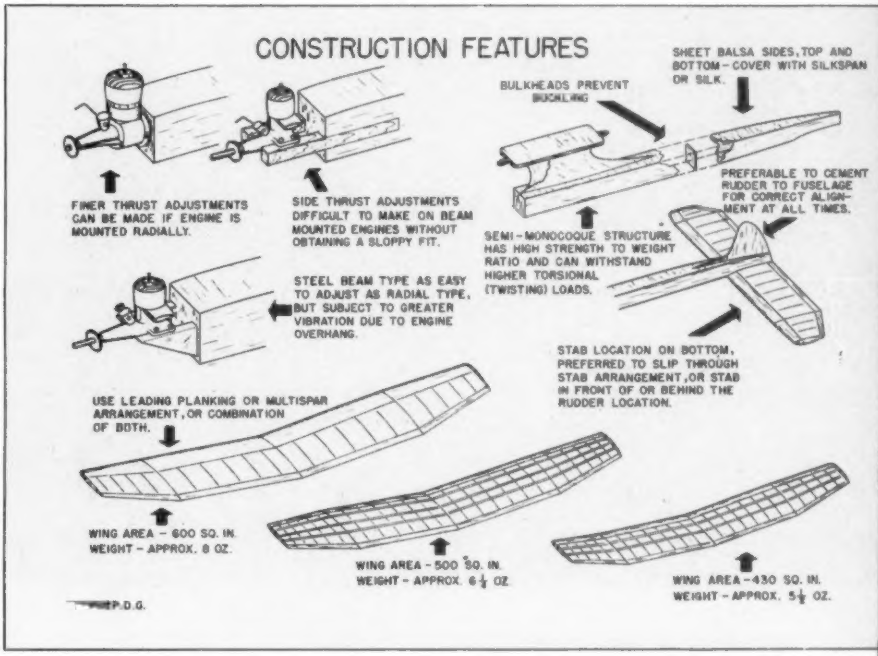
Paul Gilliam about to let go of hot *Civy Boy*. Ship will climb at the same angle right from the hand. Its unique design is analyzed in article.

▶ If angular difference between wing and stab is altered after your area, moment arms, and airfoil have been chosen, it too will change nose up or down tendencies. Suppose you have a ship that is performing reasonably well and you desire to speed up the climb. You can reduce angular difference and move CG rearward to lessen the too steep or looping climb; or you can increase angular difference and move CG forward to steepen climb angle.

The lower angular difference arrangement, which is also a lower drag arrangement, provides a much higher climb because, with a given engine prop combination, you only have a given amount of thrust available. Thrust can only accelerate model up to the point where thrust equals drag and the pull of gravity so, if you have a high drag (large angular differences), it results in a slow speed in the climb and not as much altitude in the prescribed time. If all this is true why not set wing and tail at zero° angle of attack? Well, we could get a terrific climb with the zero setup if we pointed the airplane up when launched, but recovery would be very bad or maybe dive all the way back to the ground when power cut.

Let's assume a ship that has no angular difference between wing and tail. The ship takes off (ROG), climbs for a few seconds until speed builds up, then dives in, or "goes over the hump". The cause can easily be explained. While speed is building up, the ship climbs because thrust is lifting the nose (See the sketch), and ship is being rotated around the center of drag until stabilizer lift with its long arm for a leverage overcomes the nose up and wing rotational tendency; then a modified outside loop is performed. To prevent this, move CG forward and increase angle of attack which will resist the tail force and prevent the nose's dropping. With an excess amount of angular difference between wing and tail (angle of attack), ship will take off and loop or spin. This can be stopped by downthrust in the engine, which will resist the nose's being drawn up by lift and rotational effect, or move CG back and decrease the angular difference between wing and tail. Some place between these examples would be ideal. Keep in mind that recovery after power cuts is usually better with the larger angular difference. Still, the compromise must be made.

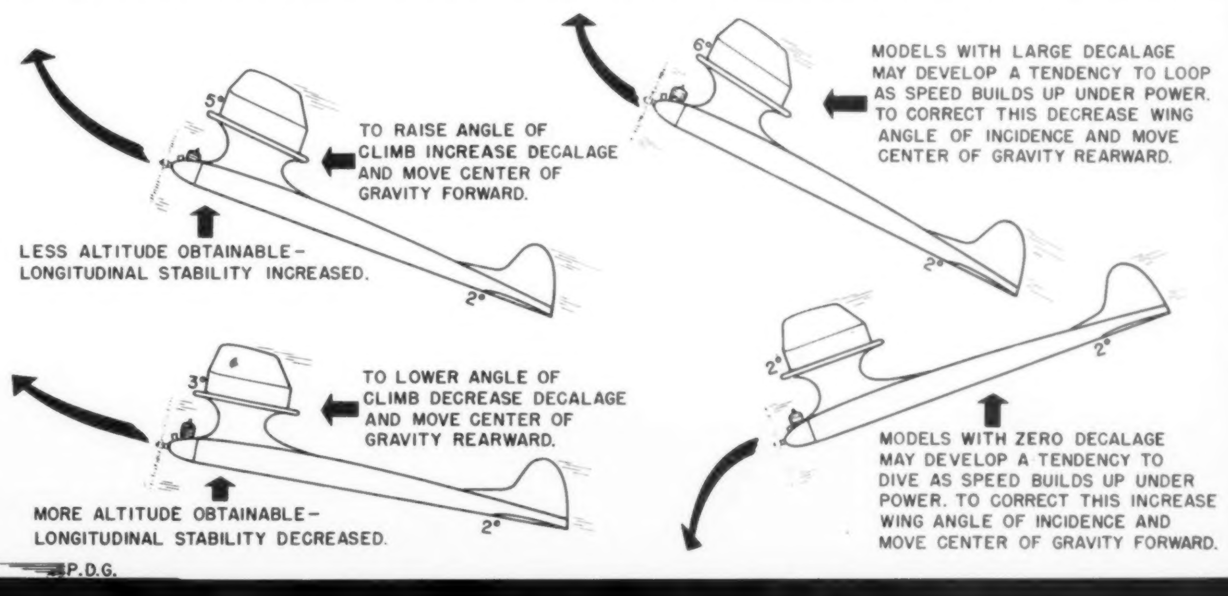
Continuing the discussion begun in March issue is this low down on construction, angular differences, C. G. position, and thrust offsets.

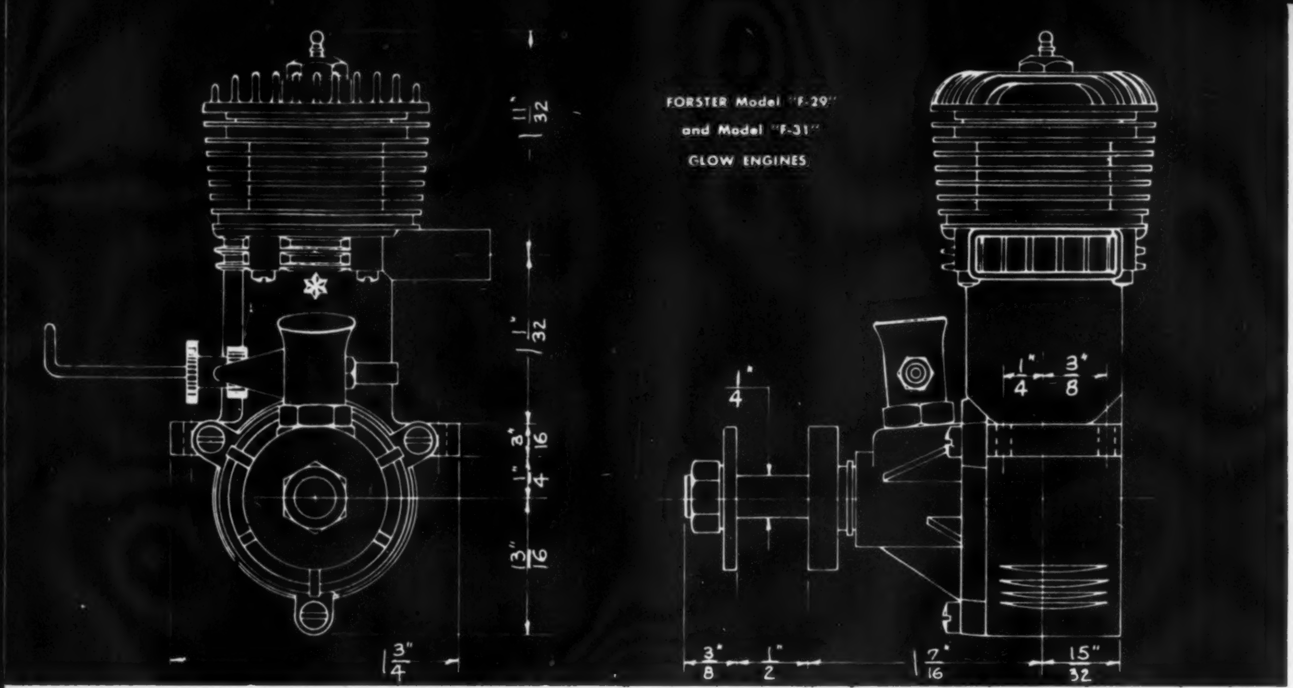


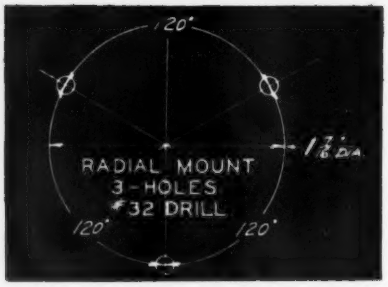
To recap for a minute: low angular differences are good in climb, high angular differences usually recover quicker. And thickness relation between wing and tail airfoil acts in the same manner; that is a thick stab and thin wing act like a low angular difference and vice versa. With flat bottom wings, I use two degree angular difference between wing and stab. For other airfoils, approximately the same figures would apply as for the flat bottom section. Location of the highest camber point on wing airfoil will change these figures slightly. A wing with its highest camber point well forward will need a little thicker or larger area stab because rotational effect is increased with moving high camber point forward in most cases.

With the angular difference I use, I still have a definite nose up tendency at full power to the point of near loop (due to my high center of drag). I counteract this with downthrust. Now that I have injected thrust in this discussion, let's examine some facts. What is downthrust? It depends on where you measure from as to what your angles are. For the sake of a place to start from, let's use the center line of the fuselage or reference line as a zero line. My force arrangement looks like this—win four degrees positive, stab two degrees positive, engine zero. Where did my downthrust go? If you notice, stab is $+2°$ and engine zero; result, $2°$ difference or $2°$ down in the engine. Why not stab at $0°$, wing at $+2°$, and engine at $-2°$? This is why: a $-2°$ in the engine would not be enough. This is due to the fact (*Continued on page* 37)

EFFECT OF ANGULAR DIFFERENCE (DECALAGE) BETWEEN WING & STAB







engine review

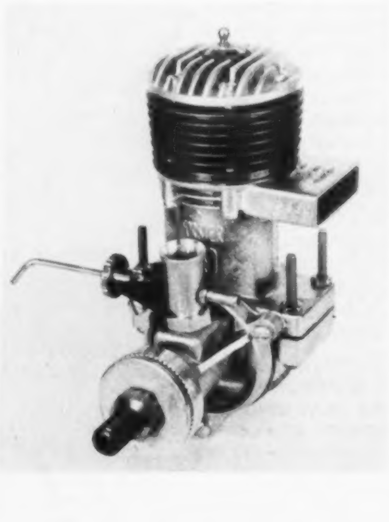
by TED MARTIN

FORSTER F-29

In switching over to the front valve in their 29, Forster adds convenience, yet equals the performance of the rear rotary G-29.

▶ Many modeling milestones are linked with the firm of Forster Brothers, who now have the enviable distinction of being the oldest established model engine manufacturer in the world still in regular production, and, we might add, still concentrating on the same engine size. Beginning their experiments back in 1932, Forster Brothers sold their first motor three years later. The Forster .29 made its appearance on the modeling public during the summer of 1940.

The basic design of the original ignition .29 was recently modified and modernized to cater for high speed glowplug operation by the introduction of a ball bearing crankshaft, aluminum piston with rings, redesigned cylinder and head, and more efficient carburation, thus bringing the engine into the racing category.



Also, to enable the same airplane to compete in two competition classes, a sister engine bored out to increase the displacement was made available.

The front rotary engine was introduced at the beginning of 1952, because of the model building simplicity offered by the more convenient intake and tank location. This decision was more fraught with problems than would at first appear, because the rotary disc valve incorporated in the earlier engines provided an extremely efficient induction system which is not easily equalled by the shaft valve layout. Also, in order to accomodate the valve port in the shaft without considerably increasing its length, meant doing away with the ball bearing and its antifrictional properties.

As might be (*Continued on page* 46)

One---One---One----

First—Hampton eliminations

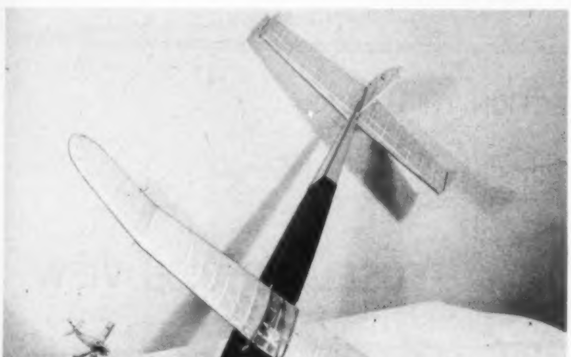
First—New York semi-finals

First—Top U. S. at finals

▼

by AUSTIN HOFMEISTER

Mrs. Hofmeister holds the model while Austin demonstrates how the geared rubber motors are wound from the front end. Author and James Horten spent four years in developing this airplane to its peak.



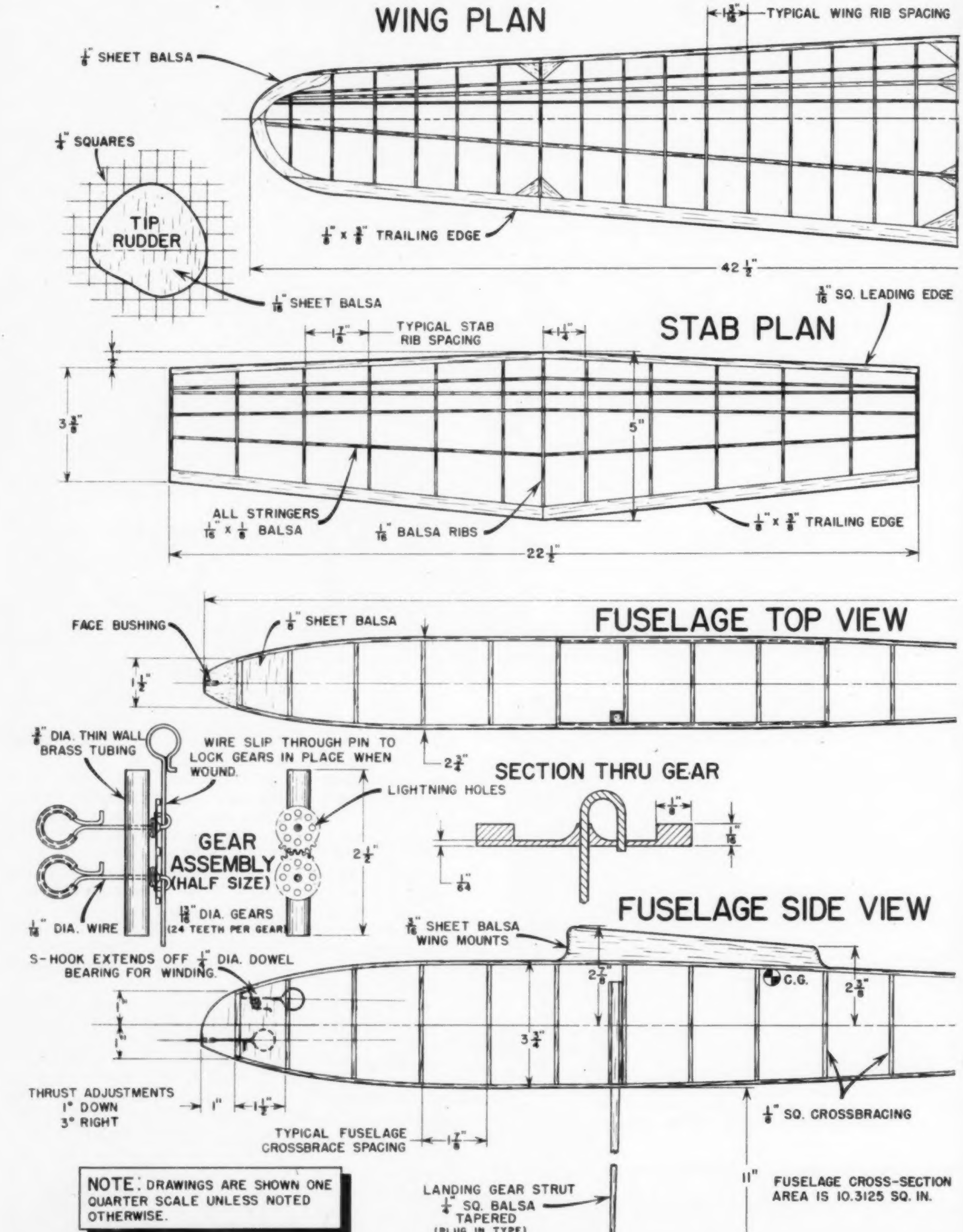
Large cup, left, from Hampton eliminations; small cup from Finnish finals. Each of two motors, 28 strands 1/8" Dunlop, made up in 29 lengths.

With increasing interest in Wakefield models, and in the use of return gears, many readers have requested a detailed plan of such a ship. The author's One-One-One was selected because of its high degree of reliability, consistent flight times. It was the U. S. best in 1951.

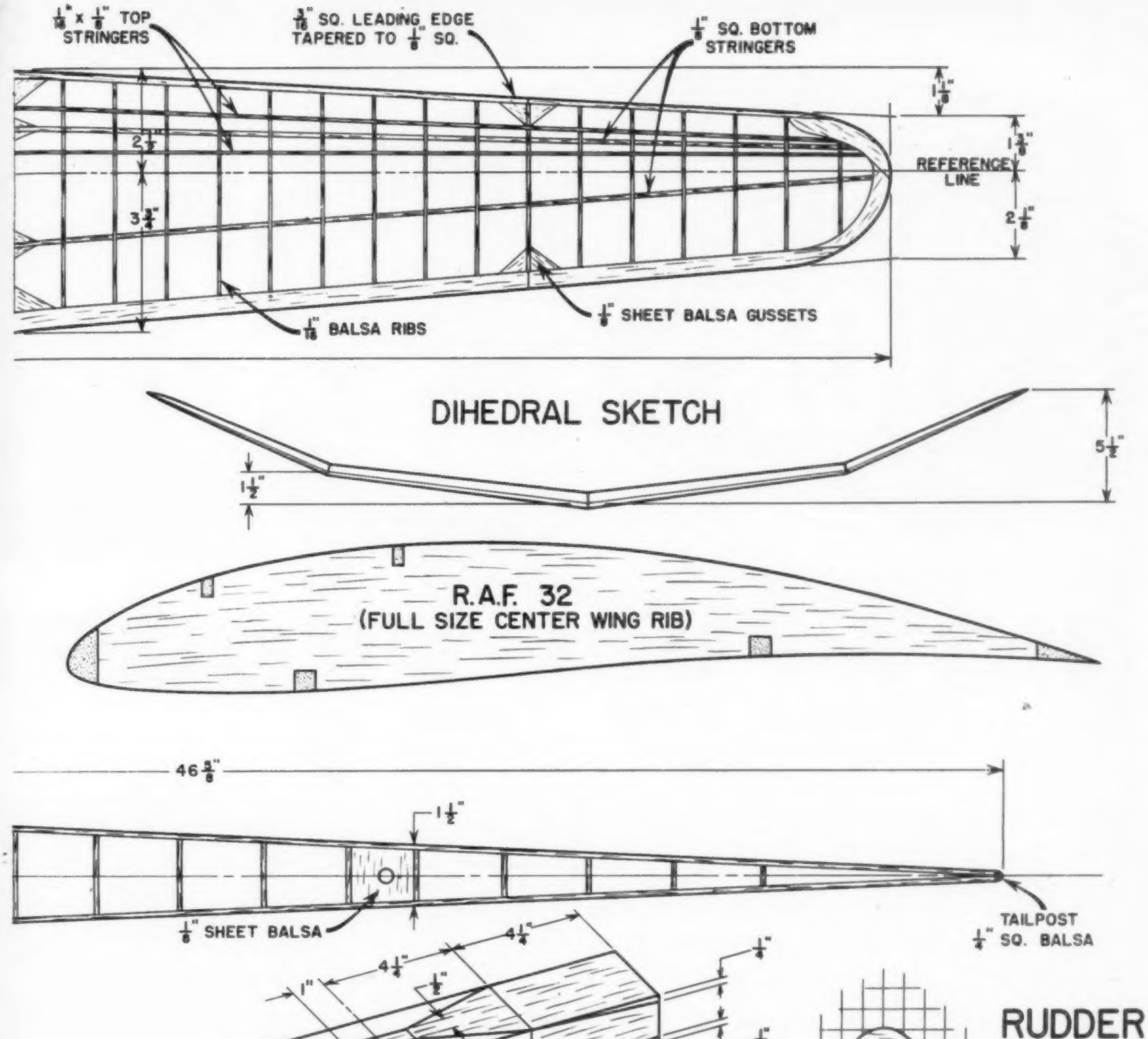
▶ The design for *One, One, One* was worked upon for the past four years by myself and a friend builder, Mr. James Horten, who also has had quite a bit of experience with a similar layout using return gears, etc. My model, used at Hampton, Virginia eliminations, was completed some three months before the meet, and ample time allowed for trimming, etc., which proved worth its while, bringing me in high all three rounds and totaling to first for that meet. The next leg of the journey was to the New York semi-finals where, once again I placed high all three rounds and totaled to first again for that meet. Both meets were held under poor conditions with wind and rain throughout flying periods. The model performed very well and I had no trouble whatsoever in stability despite conditions.

The next item on the list was, of course, the flight to Finland and the big Wakefield final. This being my first experience on the Wakefield team, I spent a good deal of time between the end of the New York meet and take-off for Finland for final trimming, checking, etc. Fortunately again, the time was well spent as my model placed rather high all three rounds in Finland, bringing me in first for the U. S. team and fifth for the actual Wakefield meet. All three flights in Finland were 200 seconds or over; the best flight was the second which, incidentally, was flown under dead air conditions of 223.6. Overall conditions were excellent. We had a slight drift about 150 ft. up, which would carry a model about 3/4 mile down the field on a four minute flight. This was no hardship for a properly adjusted model.

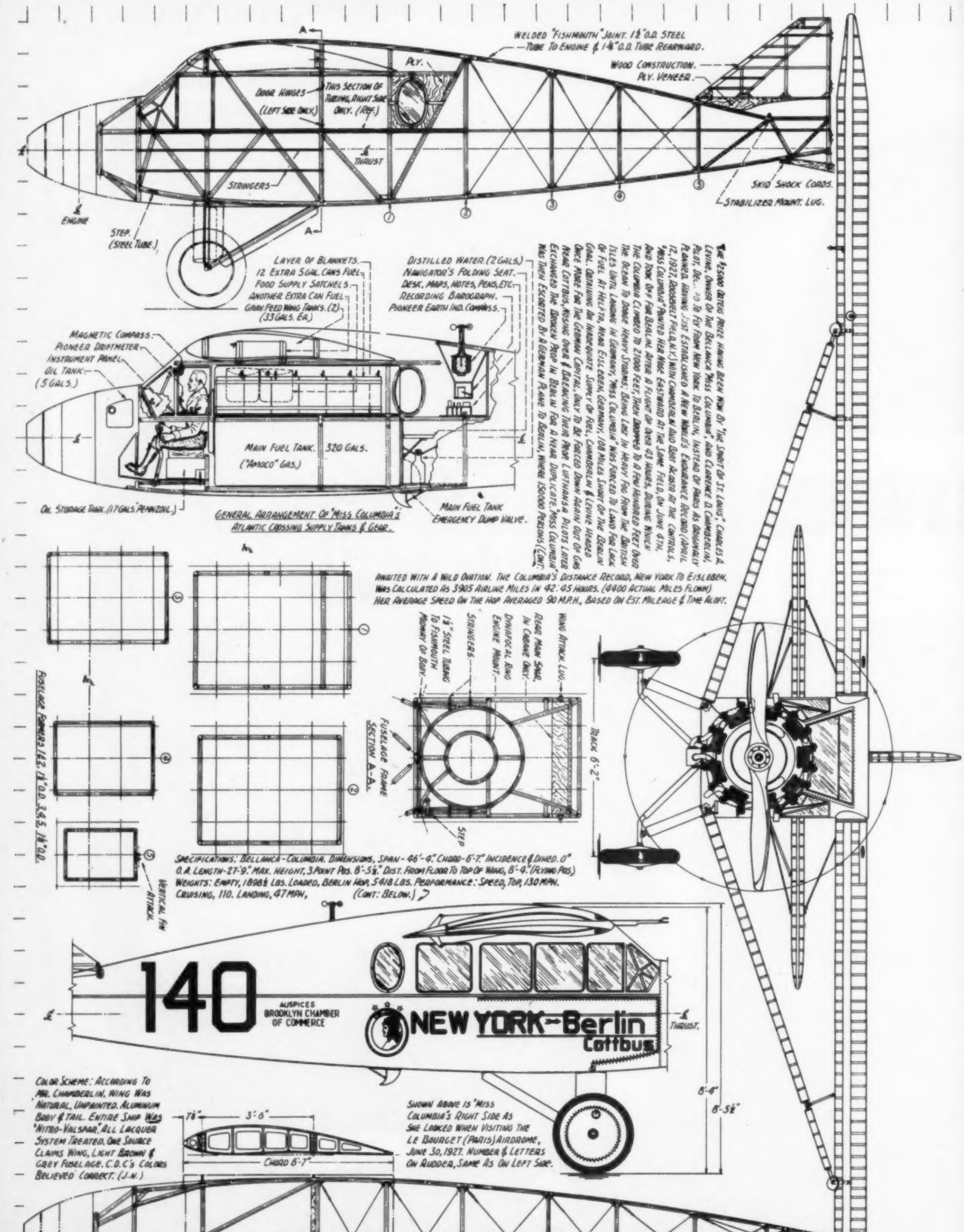
The flights in Finland are about what can be expected of a model for dead air time. Naturally, under thermal conditions there is no limit. The standard (*Continued on page 36*)



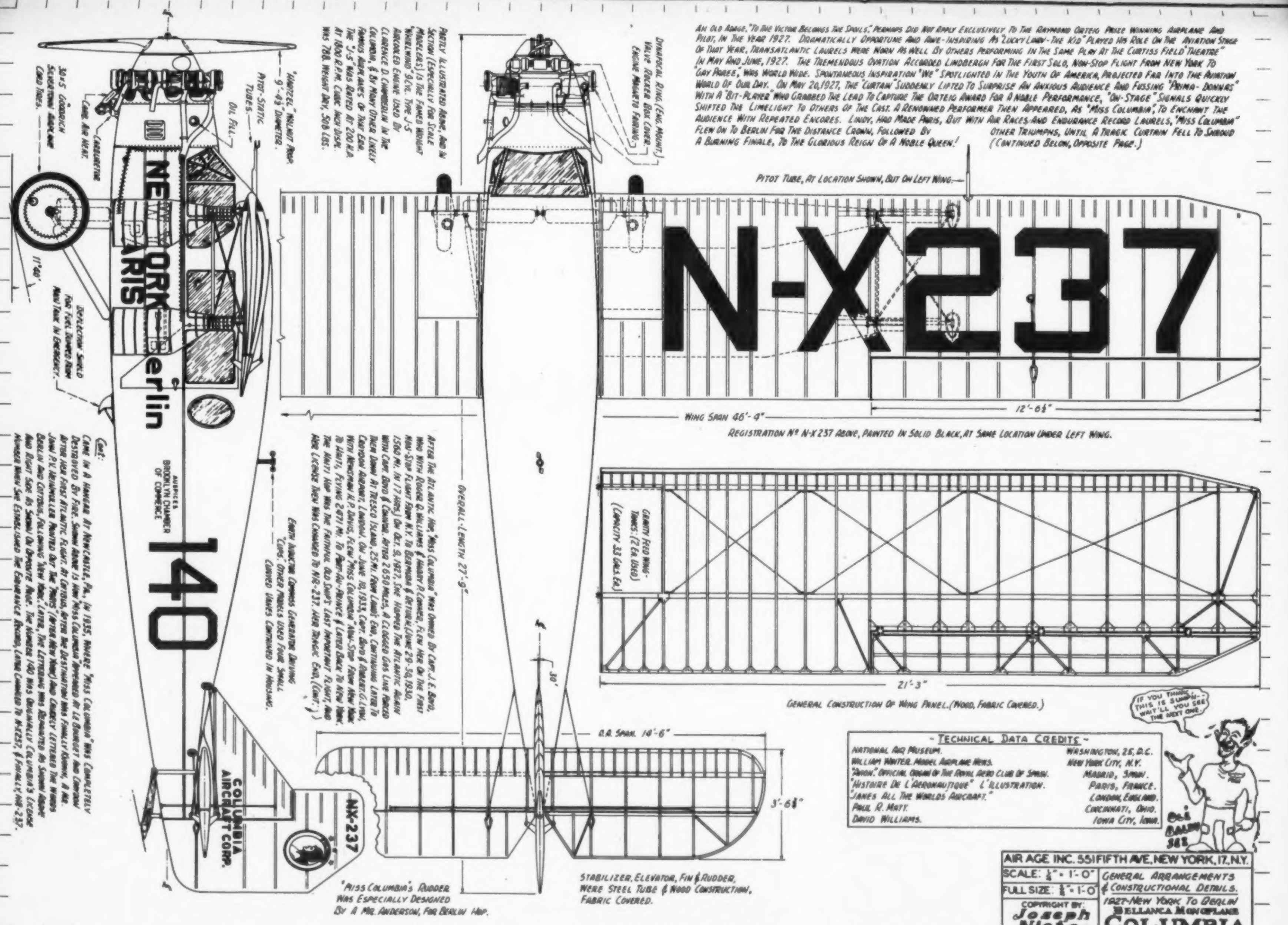
WING PLAN
1 3/16" TYPICAL WING RIB SPACING
1/8" SHEET BALSA
1/4" SQUARES
TIP RUDDER
1/8" x 3/8" TRAILING EDGE
42 1/2"
1/16" SHEET BALSA
3/16" SQ. LEADING EDGE
STAB PLAN
1 7/8" TYPICAL STAB RIB SPACING
1 1/4"
3 3/8"
5"
ALL STRINGERS 1/16" x 1/8" BALSA
1/16" BALSA RIBS
1/8" x 3/8" TRAILING EDGE
22 1/2"
FACE BUSHING
1/8" SHEET BALSA
FUSELAGE TOP VIEW
1 1/2"
2 3/4"
3/8" DIA. THIN WALL BRASS TUBING
WIRE SLIP THROUGH PIN TO LOCK GEARS IN PLACE WHEN WOUND.
LIGHTNING HOLES
SECTION THRU GEAR
GEAR ASSEMBLY (HALF SIZE)
2 1/2"
1/8"
1/16"
1/64
1/16" DIA. WIRE
13/16" DIA. GEARS (24 TEETH PER GEAR)
FUSELAGE SIDE VIEW
3/16" SHEET BALSA WING MOUNTS
S-HOOK EXTENDS OFF 1/4" DIA. DOWEL BEARING FOR WINDING.
2 7/8"
C.G.
2 3/8"
3 3/4"
THRUST ADJUSTMENTS 1° DOWN 3° RIGHT
1"
1 1/2"
1/8" SQ. CROSSBRACING
TYPICAL FUSELAGE CROSSBRACE SPACING
1 7/8"
NOTE: DRAWINGS ARE SHOWN ONE QUARTER SCALE UNLESS NOTED OTHERWISE.
LANDING GEAR STRUT 1/4" SQ. BALSA TAPERED (PLUG IN TYPE)
11"
FUSELAGE CROSS-SECTION AREA IS 10.3125 SQ. IN.
P.D.G.



1/16" x 1/8" TOP STRINGERS
3/16" SQ. LEADING EDGE TAPERED TO 1/8" SQ.
1/8" SQ. BOTTOM STRINGERS
REFERENCE LINE
1/16" BALSA RIBS
1/8" SHEET BALSA GUSSETS
DIHEDRAL SKETCH
5 1/2"
1 1/2"
R.A.F. 32
(FULL SIZE CENTER WING RIB)
46 5/8"
1 1/2"
1/8" SHEET BALSA
TAILPOST
1/4" SQ. BALSA
PROP BLOCK LAYOUT
4 1/4"
4 1/4"
1"
1/2"
1/4"
1/4"
2"
1 1/2"
1 1/8"
17"
RUDDER PLAN
1/8" SHEET BALSA
1/8" x 1/4" BALSA TAPERED
1/8" SHEET BALSA
1 1/4"
REFERENCE LINE
1/8" SQ. LONGERONS
1 1/2
1/16" x 1/8" CROSSBRACING
1/4" SQUARES
CLARK Y
(FULL SIZE CENTER TAIL RIB)
P.D.G.



WELDED "FISHMOUTH" JOINT. 1¼" O.D. STEEL
—TUBE TO ENGINE ℄ 1⅛" O.D. TUBE REARWARD.
WOOD CONSTRUCTION.
PLY. VENEER.
PLY.
DOOR HINGES
(LEFT SIDE ONLY.)
THIS SECTION OF TUBING, RIGHT SIDE ONLY. (REF.)
℄ THRUST
STRINGERS
℄ ENGINE
STEP. (STEEL TUBE.)
SKID SHOCK CORDS.
STABILIZER MOUNT. LUG.
A
1 2 3 4 5
LAYER OF BLANKETS.
12 EXTRA 5GAL. CANS FUEL.
FOOD SUPPLY SATCHELS.
ANOTHER EXTRA CAN FUEL.
GRAV. FEED WING TANKS. (2) (33 GALS. EA.)
DISTILLED WATER. (2 GALS.)
NAVIGATOR'S FOLDING SEAT.
DESK, MAPS, NOTES, PENS, ETC.
RECORDING BAROGRAPH.
PIONEER EARTH IND. COMPASS.
MAGNETIC COMPASS.
PIONEER DRIFTMETER.
INSTRUMENT PANEL.
OIL TANK. (5 GALS.)
MAIN FUEL TANK. 320 GALS. ("AMOCO" GAS.)
OIL STORAGE TANK. (17 GALS. "PENNZOIL.")
MAIN FUEL TANK EMERGENCY DUMP VALVE.
GENERAL ARRANGEMENT OF "MISS COLUMBIA'S" ATLANTIC CROSSING SUPPLY TANKS & GEAR.
THE $25000 ORTEIG PRIZE HAVING BEEN WON BY "THE SPIRIT OF ST. LOUIS", CHARLES A. LEVINE, OWNER OF THE BELLANCA "MISS COLUMBIA", AND CLARENCE D. CHAMBERLIN, PILOT, DEC..ED TO FLY FROM NEW YORK TO BERLIN, INSTEAD OF PARIS AS ORIGINALLY PLANNED. HAVING JUST ESTABLISHED A NEW WORLD'S ENDURANCE RECORD (APRIL 12, 1927, ROOSEVELT FIELD, N.Y.) WITH CHAMBERLIN AND BERT ACOSTA AT THE CONTROLS, "MISS COLUMBIA" POINTED HER NOSE EASTWARD AT THE SAME FIELD, ON JUNE 4TH, AND TOOK OFF FOR BERLIN. AFTER A FLIGHT OF OVER 43 HOURS, DURING WHICH THE COLUMBIA CLIMBED TO 21000 FEET, THEN DROPPED TO A FEW HUNDRED FEET OVER THE OCEAN TO DODGE HEAVY STORMS; BEING LOST IN HEAVY FOG FROM THE BRITISH ISLES UNTIL LANDING IN GERMANY, "MISS COLUMBIA" WAS FORCED TO LAND FOR LACK OF FUEL AT HELFTA, NEAR EISLEBEN, GERMANY, 108 MILES SHORT OF THE BERLIN GOAL. OBTAINING AN INADEQUATE SUPPLY OF FUEL, CHAMBERLIN & LEVINE HEADED ONCE MORE FOR THE GERMAN CAPITAL, ONLY TO BE FORCED DOWN AGAIN OUT OF GAS NEAR COTTBUS, NOSING OVER & BREAKING THEIR PROP. LUFTHANSA PILOTS LATER EXCHANGED THE BROKEN PROP IN BERLIN FOR A NEAR DUPLICATE. "MISS COLUMBIA" WAS THEN ESCORTED BY A GERMAN PLANE TO BERLIN, WHERE 150000 PERSONS (CONT.
AWAITED WITH A WILD OVATION. THE COLUMBIA'S DISTANCE RECORD, NEW YORK TO EISLEBEN, WAS CALCULATED AS 3905 AIRLINE MILES IN 42:45 HOURS. (4400 ACTUAL MILES FLOWN)
HER AVERAGE SPEED ON THE HOP AVERAGED 90 M.P.H., BASED ON EST. MILEAGE & TIME ALOFT.
WING ATTACH. LUG.
REAR MAIN SPAR, IN CABANE ONLY.
DYNAFOCAL RING ENGINE MOUNT.
STRINGERS.
1¼" STEEL TUBING TO FISHMOUTH MIDWAY OF BODY.
STEP
TRACK 6'-2"
FUSELAGE FRAME SECTION A-A.
FUSELAGE FORMERS 1 & 2, 1¼" O.D. 3, 4, 5, 1⅛" O.D.
VERTICAL FIN ATTACH.
SPECIFICATIONS: BELLANCA-COLUMBIA. DIMENSIONS, SPAN-46'-4". CHORD-6'-7". INCIDENCE & DIHED. 0° O.A. LENGTH-27'-9". MAX. HEIGHT, 3 POINT POS. 8'-5½". DIST. FROM FLOOR TO TOP OF WING, 8'-4". (FLYING POS.) WEIGHTS: EMPTY, 1898½ LBS. LOADED, BERLIN HOP, 5418 LBS. PERFORMANCE: SPEED, TOP, 130 MPH. CRUISING, 110. LANDING, 47 MPH, (CONT: BELOW.)
140
AUSPICES BROOKLYN CHAMBER OF COMMERCE
NEW YORK→Berlin
Cottbus
℄ THRUST.
8'-4"
8'-5½"
COLOR SCHEME: ACCORDING TO MR. CHAMBERLIN, WING WAS NATURAL, UNPAINTED. ALUMINUM BODY & TAIL. ENTIRE SHIP WAS "NITRO-VALSPAR." ALL LACQUER SYSTEM TREATED. ONE SOURCE CLAIMS WING, LIGHT BROWN & GREY FUSELAGE. C.D.C.'S COLORS BELIEVED CORRECT. (J.N.)
7½"
3'-6"
CHORD 6'-7"
SHOWN ABOVE IS "MISS COLUMBIA'S" RIGHT SIDE AS SHE LOOKED WHEN VISITING THE LE BOURGET (PARIS) AIRDROME, JUNE 30, 1927. NUMBER & LETTERS ON RUDDER, SAME AS ON LEFT SIDE.



AN OLD ADAGE, "TO THE VICTOR BELONGS THE SPOILS," PERHAPS DID NOT APPLY EXCLUSIVELY TO THE RAYMOND ORTEIG PRIZE WINNING AIRPLANE AND PILOT, IN THE YEAR 1927. DRAMATICALLY OPPORTUNE AND AWE-INSPIRING AS "LUCKY LINDY-THE KID" PLAYED HIS ROLE ON THE AVIATION STAGE OF THAT YEAR, TRANSATLANTIC LAURELS WERE WORN AS WELL BY OTHERS PERFORMING IN THE SAME PLAY AT THE CURTISS FIELD "THEATRE" IN MAY AND JUNE, 1927. THE TREMENDOUS OVATION ACCORDED LINDBERGH FOR THE FIRST SOLO, NON-STOP FLIGHT FROM NEW YORK TO "GAY PAREE," WAS WORLD WIDE. SPONTANEOUS INSPIRATION "WE" SPOTLIGHTED IN THE YOUTH OF AMERICA, PROJECTED FAR INTO THE AVIATION WORLD OF OUR DAY. ON MAY 20, 1927, THE "CURTAIN" SUDDENLY LIFTED TO SURPRISE AN ANXIOUS AUDIENCE AND FUSSING "PRIMA-DONNAS" WITH A "BIT-PLAYER" WHO GRABBED THE LEAD TO CAPTURE THE ORTEIG AWARD FOR A NOBLE PERFORMANCE, "ON-STAGE" SIGNALS QUICKLY SHIFTED THE LIMELIGHT TO OTHERS OF THE CAST. A RENOWNED PERFORMER THEN APPEARED, AS "MISS COLUMBIA", TO ENCHANT THE AUDIENCE WITH REPEATED ENCORES. LINDY, HAD MADE PARIS, BUT WITH AIR RACES AND ENDURANCE RECORD LAURELS, "MISS COLUMBIA" FLEW ON TO BERLIN FOR THE DISTANCE CROWN, FOLLOWED BY OTHER TRIUMPHS, UNTIL A TRAGIC CURTAIN FELL TO SHROUD A BURNING FINALE, TO THE GLORIOUS REIGN OF A NOBLE QUEEN! (CONTINUED BELOW, OPPOSITE PAGE.)
PITOT TUBE, AT LOCATION SHOWN, BUT ON LEFT WING.
DYNAFOCAL RING. (ENG. MOUNT.)
VALVE ROCKER BOX COVER.
ENGINE MAGNETO FAIRING.
N-X237
WING SPAN 46'-4"
12'-6½"
REGISTRATION Nº N-X237 ABOVE, PAINTED IN SOLID BLACK, AT SAME LOCATION UNDER LEFT WING.
GRAVITY FEED WING-TANKS: (2 EA. USED) (CAPACITY 33 GALS. EA.)
21'-3"
GENERAL CONSTRUCTION OF WING PANEL. (WOOD, FABRIC COVERED.)
IF YOU THINK THIS IS SUMP'N-WAIT'LL YOU SEE THE NEXT ONE.
- TECHNICAL DATA CREDITS -
NATIONAL AIR MUSEUM. WASHINGTON, 25, D.C.
WILLIAM WINTER. MODEL AIRPLANE NEWS. NEW YORK CITY, N.Y.
"AVION." OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF SPAIN. MADRID, SPAIN.
"HISTOIRE DE L'AERONAUTIQUE" L'ILLUSTRATION. PARIS, FRANCE.
"JANES ALL THE WORLDS AIRCRAFT." LONDON, ENGLAND.
PAUL R. MATT. CINCINNATI, OHIO.
DAVID WILLIAMS. IOWA CITY, IOWA.
PARTLY ILLUSTRATED ABOVE, AND IN SECTION (ESPECIALLY FOR SCALE MODELERS) IS THE FAMED WRIGHT "WHIRLWIND" 9 CYL. TYPE J-5 AIRCOOLED ENGINE USED BY CLARENCE D. CHAMBERLIN IN THE COLUMBIA, & BY MANY OTHER LIKELY FAMOUS AIRPLANES OF THAT ERA. THE "J-5" WAS RATED AT 200 H.P. AT 1800 R.P.M. CUBIC INCH DISPL. WAS 788. WEIGHT DRY, 508 LBS.
"HARTZEL" WALNUT PROP. 9'-4½" DIAMETER.
PITOT-STATIC TUBES.
OIL FILL.
CARBURETOR
CARB. AIR HEAT.
30×5 GOODRICH SILVERTOWN AIRPLANE CORD TIRES.
11°40'
DEFLECTION SHIELD FOR FUEL DUMPED FROM MAIN TANK IN EMERGENCY.
OVERALL-LENGTH 27'-9"
AFTER THE ATLANTIC HOP, "MISS COLUMBIA" WAS OWNED BY CAPT. J. E. BOYD, WHO WITH ROGER Q. WILLIAMS & HARRY P. CONNOR, FLEW HER ON THE FIRST NON-STOP FLIGHT FROM N.Y. TO BERMUDA & RETURN (JUNE 29-30, 1930, 1560 MI. IN 17 HRS.) ON OCT. 9, 1927, SHE HOPPED THE ATLANTIC AGAIN WITH CAPT. BOYD & CONNOR. AFTER 2650 MILES, A CLOGGED GAS LINE FORCED THEM DOWN AT TRESCO ISLAND, 25 MI. FROM LAND'S END, CONTINUING LATER TO CROYDON AIRPORT, LONDON. ON JUNE 10, 1933, CAPT. BOYD & ROBERT G. LYON, WITH NEWSMAN H.P. DAVIS, FLEW "MISS COLUMBIA" NON-STOP FROM NEW YORK TO HAITI, FLYING 2471 MI. TO PORT-AU-PRINCE & LATER BACK TO NEW YORK. THE HAITI HOP WAS THE FAITHFUL OLD SHIP'S LAST IMPORTANT FLIGHT, AND HER LICENSE THEN WAS CHANGED TO NR-237. HER TRAGIC END, (CONT.)
EARTH INDUCTOR COMPASS GENERATOR DRIVING "CUPS". OTHER MODELS USED FOUR SMALL CURVED VANES CONTAINED IN HOUSING.
NEW YORK PARIS Berlin
AUSPICES BROOKLYN CHAMBER OF COMMERCE
140
COLUMBIA AIRCRAFT CORP.
NX-237
30°
O.A. SPAN 14'-6"
3'-6½"
"MISS COLUMBIA'S RUDDER WAS ESPECIALLY DESIGNED BY A MR. ANDERSON, FOR BERLIN HOP.
STABILIZER, ELEVATOR, FIN & RUDDER, WERE STEEL TUBE & WOOD CONSTRUCTION, FABRIC COVERED.
CONT:
CAME IN A HANGAR AT NEWCASTLE, PA., IN 1935, WHERE "MISS COLUMBIA" WAS COMPLETELY DESTROYED BY FIRE. SHOWN ABOVE IS HOW "MISS COLUMBIA" APPEARED AT LE BOURGET AND CROYDON AFTER HER FIRST ATLANTIC FLIGHT. AT COTTBUS, AFTER THE DESTINATION WAS FINALLY KNOWN, A MR. JOHN P.V. HEINMULLER PAINTED OUT THE "PARIS" (AFTER NEW YORK) AND CRUDELY LETTERED THE WORDS BERLIN AND COTTBUS, FOLLOWING "NEW YORK". LATER, THE LETTERING WAS REPAINTED AS SHOWN ABOVE AND RIGHT SIDE AS SHOWN ON OPPOSITE PAGE. THE NUMBER 140 WAS ORIGINALLY COLUMBIA'S LICENSE NUMBER WHEN SHE ESTABLISHED THE ENDURANCE RECORD, LATER CHANGED TO N-X237, & FINALLY, NR-237.
AIR AGE INC. 551 FIFTH AVE, NEW YORK, 17, N.Y.
SCALE: ¼" = 1'-0"
FULL SIZE: ¾" = 1'-0"
GENERAL ARRANGEMENTS & CONSTRUCTIONAL DETAILS.
COPYRIGHT BY: Joseph Nieto.
1927-NEW YORK TO BERLIN BELLANCA MONOPLANE COLUMBIA

With Clarence Chamberlin at the controls, and the first transatlantic passenger, Charles Levine aboard, the Bellanca takes off June 4, 1927, Berlin-bound.

the COLUMBIA

by ROBERT C. HARE

The most efficient weight lifter of its time, the Bellanca set a non-refueling mark of more than 51 hours, then flew non-stop from N.Y. to Germany.

On the morning of April 12, 1927, a small crowd watched breathlessly as a squarish looking monoplane wobbled down the runway at Roosevelt Field, Long Island, and finally became airborne. It climbed slowly out of the field, took its time getting altitude, then settled down to a monotonous circling of the Long Island area. At the ship's dual controls were Clarence Chamberlin and Bert Acosta, two of America's outstanding early pilots. On April 14—51 hours, 11 minutes and 14 seconds after taking off—the two men landed the plane to set a new non-refueling endurance record.

The airplane, Bellanca model W-B 2, still was destined to complete the first non-stop flight from the United States to Germany and emblazon itself and its designer in the permanent annals of aviation history. The W-B 2 was the result of many years of a man sticking to his conviction that all airplanes eventually would be monoplanes. That man—designer of the W-B 2—was Guiseppe Bellanca.

Bellanca's interest in aviation dated back to his boyhood in Italy, where he avidly followed the attempts of various pioneers of that day to fly. In 1906, while still a student in Milan, he began theoretical experiments in flight. During 1908 and 1909, he collaborated with (*Continued on page* 40)

Outstanding efficiency proved in air meets of previous year, the Columbia carried 455 gallons on its transatlantic hop. The wide, lifting struts are visible.

Ideas For R. C.

by E. PAUL JOHNSON

A leading exponent of pulse system discusses additional controls and three tube receiver. Will keep rc fans busy for a month of Sundays.

Johnson, three of his radio control jobs and transmitter with pulser. Plane in hand contains three-tube receiver in article; plane in foreground two-speed motor; other plane has elevator control.

▶ If an arrangement were made in a plane so that signal off at transmitter gave left rudder, and signal on gave right rudder, you could make nice left or right turns merely by leaving transmitter key off for left turn and on for right turn. You would know exactly just which way the plane would go. A radio controlled plane can be flown nicely this way but it is better to have a neutral position for straight flight. To get this, a device is connected to the transmitter to pulse signal on and off, four to ten times a second. This device is called a pulser. With rudder pulsing at this or any greater speed, the plane will fly in a perfectly straight line, just as if the rudder was standing still in the middle. Up to this time, all pulsers have been made from a small electric motor and gear train, but it is often difficult to get a good motor and gear train; even then, they do not always run as smoothly as is desirable. Also, usually some outside battery source, such as a six volt hot shot battery, is needed to drive motor.

To fly a plane with pulse control, all that is needed is a pulser of some sort on the transmitter for neutral flight, a three position switch that will allow pulser to pulse transmitter in middle or neutral position, turn transmitter signal off in left position and turn transmitter signal on in right position. In the plane, some sort of device is needed to turn rudder left with no signal and right on receipt of a signal. The best arrangement so far discovered to do this trick is one of George Trammells' "actuators". (Nov., Dec. 1950 issue of M.A.N.)

I have developed a pulser which contains its own battery source, does not use a motor and will run at constant speed without variation (Fig. one). It consists of an 8000 ohm Sigma 5F relay with a 60 mf electrolytic condenser across winding. A 45 volt battery, a 10,000 ohm potentiometer and normally closed contacts on the relay are all connected in series across relay winding and condenser. Connected in this way relay will pulse. The potentiometer is a pulse equalizer. Pulses can be made to vary in length by varying the potentiometer. If it is turned one way, pulses will be long on one side and short on other; if turned the other way, vice versa is true. A plane can be flown using the potentiometer as a control handle. Speed of pulses can be changed by changing size of electrolytic condenser. The smaller the condenser the faster it will pulse. For a battery source, I use old XX30E "B" batteries taken from my plane when they are too weak to work radio properly. They are still good for many months use in the pulser.

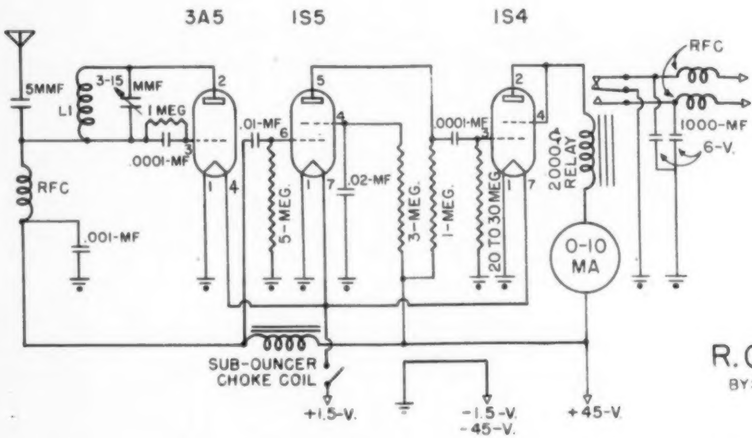
You will notice that battery source is connected through normally closed contacts of relay to winding of relay. Relay winding has 8000 ohms of resistance while condenser in an uncharged condition has practically zero resistance. Thus, at first most of the current from battery flows into condenser. When condenser becomes charged from flow of current, its resistance becomes infinite and current then flows into relay winding, actuating it and opening normally closed contacts. This cuts off battery source but relay remains actuated for a short time due to charge in condenser across winding. When charge in condenser leaks off through winding, relay deactuates, relay contacts close again and the whole process starts over. It can be seen by this that speed of pulses is determined by charging and discharging time of condenser. Thus, size of condenser determines pulse speed.

Fig. two shows how control handle is connected to pulser so that center position gives a pulsing signal or neutral, left position gives signal off or left, and right position gives signal on or right. The switch used can be either a Switchcraft Lev-R-Switch or a Federal Anti-Capacity switch and is connected to pulse box by a three conductor cable six to eight feet long. These switches are obtainable at nearly all radio supply stores. The long cable gives freedom of movement to the operator so he can move his position enough to keep plane in sight at all times.

The "actuator" I use is the type designed by George Trammell. General construction of an "actuator" is shown in Fig. five. Basically it is a small permanent magnet with a short length of wire soldered to middle of one side. This wire is the actuator shaft and (*Continued on page* 42)

R.C. IDEAS

BY: PAUL JOHNSON



L1-16 TURNS #24 ENAMELED WIRE ON 1/4" FORM
RFC-#32 ENAMELED WIRE-WOUND ON 2 MEG. 1/2 WATT RESISTOR

FIG. 8

NOTE: SEE SEPERATE SCHEMATIC DIAGRAM FOR 27 MC RECEIVER

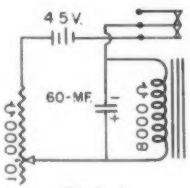


FIG. 1

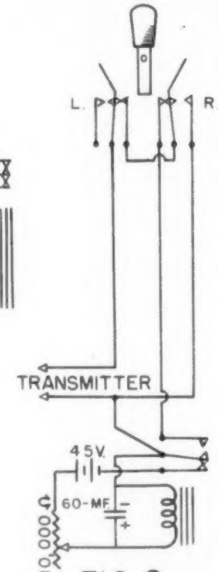


FIG. 2

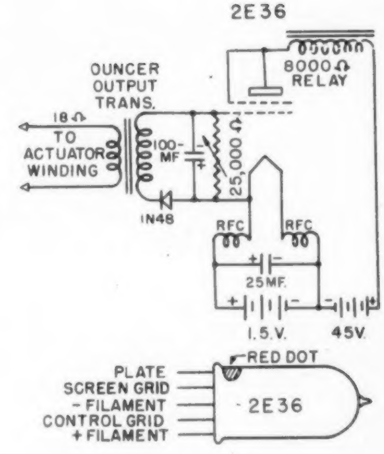


FIG. 3

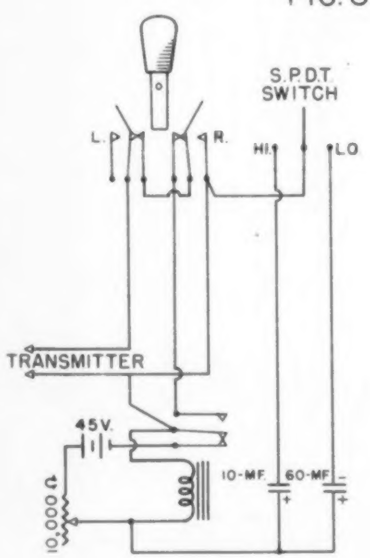


FIG. 4

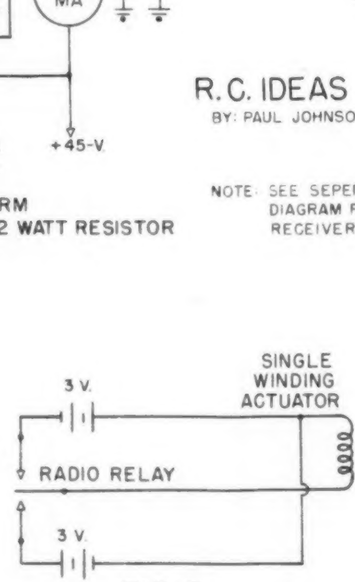


FIG. 6

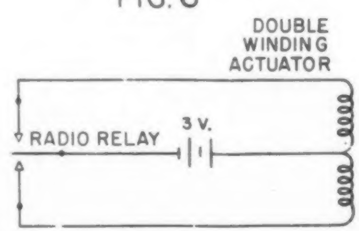


FIG. 7

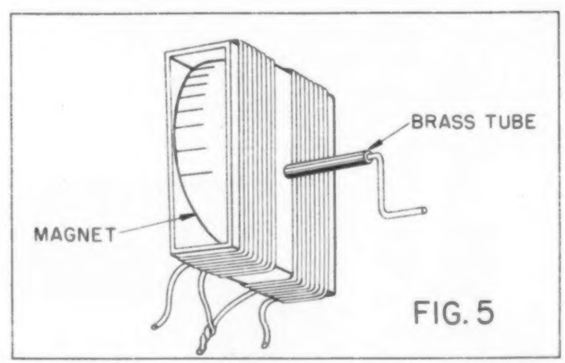


FIG. 5

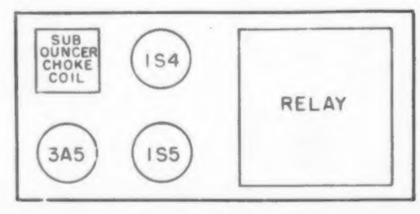


FIG. 9

One—One—One

(Continued from page 25)

return gear system used in the model in my opinion, is best. However, a single motor may be used, in which case, same should be made up into a 50" length and corded. A single motor used in past similar layouts has been successful.

Now to actual construction of the model. Starting with fuselage, main stringers and all uprights are 1/8" sq. stock of simple box construction. Lay out two sides on plan. After these have dried, place cross members in position to complete bare fuselage construction. Next, fill in rear section as marked on drawing with 1/8" sheet balsa as gear mounting. Nose is also filled in with 1/8" sheet to give strength and as a mounting for one motor. Gears, which are 3/4" in diameter, are mounted on a piece of 3/8" thin wall brass tubing. This tubing is cemented in firmly through 1/8" sheet balsa. Alignment must be true to insure proper gear action and to reduce friction. Note that at upper side view of nose is shown a short piece of 1/4" dowel rod through the nose. This is the top motor mounting and is also cemented in firmly. This setup does away with two nose blocks, upper motor being secured by a special S hook. Landing gear box is installed next. It is made up of pieces of 1/16" sheet balsa built up around a piece of 1/4" sq. balsa. Thus, after this box is completed, a piece of 1/4" sq. will be a push fit into the box. These 11" lengths of 1/4" balsa are used as landing gears (gears break off upon landing and a new gear is pushed in before each flight; thus mounting in fuselage itself can be very light without worry of structural damage). This completes actual construction of fuselage. Cover with light tissue, give one coat of dope on *inside* with an atomizer and then brush on *four* coats on *outside;* inside coat will protect both tissue and wood from rubber lubricant.

We may now go on to elevator and rudder construction. As on plan, lay out leading edge of 3/16" sq. tapering same to 3/32" at tips. Four spars are of 1/8" x 1/16" set on edge in ribs. Trailing edge is 1/8" x 3/8" beveled to match Clark Y rib section; all ribs are of 1/16" sheet. Regarding rudder, outline is cut from 1/8" sheet; main rudder post is of 1/8"x1/4" tapered to 1/8" sq. at tip; trailing edge is of 1/8" sq.; ribs are 1/8" x 1/16" strips formed around center post to a streamlined section. Rudder trim tab is made up of 1/8" sheet and cemented to trailing edge of main rudder. To set tab, cement joint is cracked, rudder turned and re-cemented; thus, after final set is found, it will not change at any time to spoil flights. Outer two tip rudders are made of 1/16" sheet and are cemented to elevator tips after assembly into fuselage. All surfaces have three coats of thinned dope.

Now to main wing. As on plan, lay out leading edge of 3/16" strip which is once again tapered to 3/32" at tips. Four spars are of 1/8" sq. and of 1/8" x 1/16". The two across bottom of wing are 1/8" sq. and two top spars are 1/8" x 1/16" set on edge. Rib section is RAF 32, no alterations whatsoever. All are cut from 1/16" stock. Wingtips are cut from 1/8" sheet; trailing edge is once again 1/8" x 3/8" beveled to proper air section shape to match RAF 32 ribs. Dihedral breaks are 1-1/2" inner section and 5-1/2" outer section according to plans. Give wing three coats of thinned dope.

Prop is made up from a block 1-1/2" x 2" x 17" and is blanked out per drawing. Brass hinge plate, made from 1/16" stock 1/2" wide, is cemented and threaded on after prop is completed. Hinge wire is 1/16" diameter. It too is cemented and threaded to blades. After entire assembly is completed, cut blades loose from center section. Four to six coats of dope are applied to give a good smooth finish.

Rubber motors are 29" in length, made up of 28 strands each of 1/8" Dunlop rubber, 1/24" thick. I always use 1/8" rubber in all models. I have used this size for over 17 years without exception and have always had less rubber trouble with small width rubber. Larger sizes have the habit of breaking completely whereas 1/8" rubber, in my experience, breaks down one strand or so at a time, and reduces danger of model damage.

I feel that some word should be given to those who have not as yet tried the return gear system in a rubber powered model, regarding construction, etc. Gears used in my model were made by Thomas E. Murphy, 1702 Woodbine St., Brooklyn, N. Y. Entire unit weighs about 1/2" ounce. This weight could have been cut down; however, I feel that the present unit is so foolproof that it is far worth its weight. To start, gears are 13/16" outside diameter; these are mounted on a piece of thin wall (1/32") 3/8" brass tubing on 1/16" diameter shafts spaced 3/4" apart. This gives proper tooth clearance. I suggest that you drill tube first, then place two long pieces of 1/16" wire through holes. Double check that these wires are PERFECTLY parallel; if not, try another piece of tubing until you have a perfectly true job. Rear ends of shafts are U shaped so that a piece of wire may be passed through at rear of model to lock gears out while winding. Be sure to pull this pin before launching model. Both motors are wound clockwise in same manner as a normal model is wound.

Flying instructions: set nose block to give one degree down-thrust and three degrees right-thrust. Along with this, set rudder tab over 1/8" at base to give right glide turn. You will find this model extremely easy to adjust. It will operate with large or small circles in glide; however, best time has always been made with circle diameter of about 350 to 400 ft. It should be flat; in fact, seem to have no angle of glide but simply a slow sink. Should you have stall trouble, *decrease* wing incidence and take out some rudder turn. *Increase* side-thrust to right; thus, you will be decreasing size of climb *without* putting model into tight glide

circle. Should trouble lie in glide stall only, then decrease wing incidence only and let all other settings as they are, etc. A few trial flights will bring model into trim where it should be doing at least three minutes per flight on 500 turns. I used 550 turns per motor at Finnish meet; however, my winder was failing and I was having a lot of difficulty getting turns in. Use a *heavy* winder for contests; motors will take 600 to 620 turns each without damage if lubed and broken in properly.

BILL OF MATERIALS

Longerons, uprights, wing leading edges (both front wing and stab)—20 strips 1/8" x 1/8" x 36" soft wood. Wing, tail stringers—9 strips 1/8" x 1/16" soft wood. Rudder outline, nose and gear box filling — one sheet 1/8" x 2" x 24". Sub rudders — laminated 1/16" sheet. Trailing edge (wing, stab) — three strips 1/8" x 1/4" soft wood. Ribs (wing, stab) — four sheets 1/6" x 2" x 36" very soft wood. Gears—Thomas Murphy; gear bushings—2" length, 1/16" i.d. brass tubing; gear post — 3" length, 1/32" wall 1/4" o.d. brass tubing. Shafts for gears, prop hinges, front S hook—1 length 1/16" dia. piano wire 36" long. Prop hinge — 1 piece sheet brass 1/16" thick x 1/4" x 3" length. Front fixing for top motor—1 piece 2" x 1/4" hardwood dowel stock. Covering—3-1/2" sheets Jap Tissue; Prop block—soft wood 17" x 1-1/2" x 2". Large face bushings—1/16" shaft size x 3/4" face (1 for nose, 2 for prop). English 3/16" or 1/4" special five ball race type ball bearing unit—(1 for prop, 2 for gear box). Dope—10 ounces very thin. Rubber—28 strands (two motors) 30" long, takes 5-1/2 ozs. of Dunlop 1/8".

Under the 1953 Wakefield rules soon to be announced, rubber weight is limited to 2.8 ounces. This model can be easily modified.

Secrets

(Continued from page 23)

that the prop blast is not pointed directly at the stab and would require more downthrust in the engine to obtain the same effect. The reason I couldn't reduce angular difference and move CG back, thereby eliminating necessity of downthrust, was a compromise with my recovery after engine cut. Less angular difference than 2° on my ship would result in a very slow recovery to the danger point — just one compromise after another. Almost the same result as adding downthrust is to lower center of drag. This drag center could be lowered by using a lower pylon or raising thrust line to give a lesser difference between thrust reaction and total airplane resistance.

To this point almost all consideration has been given to factors affecting climb. How are these areas, angular differences, going to affect our glide? In the glide, it is mainly sinking rate that we are concerned with. These low angular differences usually give us a higher speed because of less drag; however, sinking rate is usually less, and that's all that counts anyway. With these low angles of attack and CG moved back, stab is working and providing more lifting surface to support the model. The low angular difference set up with CG too far back can be overdone and a very poor glide can result.

To give an example, let's imagine a model that has CG well back of the wing trailing edge. With a load arrangement like this, stab will carry more than its share of weight and cause "tail stalls". The ship being described would be very critical to adjust in glide; it could dive in on the glide one time and stall the next without changing any adjustments. This rearward CG location, if not too excessive, could produce a reasonably good glide in dead air, but in wind or turbulence, severe stalls would occur. We want consistency in any type weather, so make a compromise and don't go too far rearward with the CG. A very large, lightly loaded stab will tend to

spin in or dive in strong turbulent thermals.

To stay on the safe side and maintain dynamic stability in the glide, I usually locate my CG at a point 85 percent of the chord from the leading edge. And, making minor adjustment to my angular difference, set up for the best glide — provided I don't have to go below my 2° setting. I just found out from test flights and a multitude of "clobbered" ships that I couldn't be safe in all types of pull outs, weather elements, etc., with CG any farther back, which would necessitate less angular difference. With other airfoils, area combinations, etc., CG could go farther back or forward than my 85 percent idea. This was just my compromise for consistency and all-around performance.

A very good example of CG location is Paul Gilliam and his *Civy Boy* design. Paul balances exactly on the rear of wing and at almost no angular difference between wing and tail. From all that I can determine by checking Paul's plans, he is able to do this by using a stab section thinner than I use and a longer tail moment arm with a wing airfoil that apparently has a great tendency to lift its leading edge, or rotate at higher speeds, along with a model that has a high center of drag. This setup produces a very fine airplane but, like anything else, can be dangerous in the hands of modelers who don't stop to analyze the situation before making drastic adjustments.

As far as construction is concerned, everyone has his "pet" construction methods, so I will only attempt to "highlight" some general features. We must have a ship that is easy to build and repair. Too many contests are lost because good repairs can't be made quickly, and this is especially true of "fancy" complicated structures.

First, what must the fuselage do? Then, how can it be built to best do its job? The first question seems easy; it must provide an engine mount, a place to set the wing, a housing for most of the gadgets, a place for tail assembly, and one other very important feature: it must hold wing and tail in their proper relationship no matter what tries to move them (up to a limit, of course).

The second question is tough, if not impossible. To best do its job, fuselage must fulfill certain requirementse; let's take one item at a time. The engine mount is a good place to start; I prefer the radial mount to any other because it lends itself to "finer" adjustments. There isn't anything wrong with a "beam" mount except thrust adjustments to right or left are very difficult to make. Most builders who use these beam mounts either make no side-thrust adjustments at all or drill out mounts to a sloppy fit so that engine can be slipped to one side or the other. I don't recommend either of these because, no matter how well the ship is engineered, it will require some thrust adjustment, and if this adjustment is not absolutely foolproof, it will result in disaster. Radial mounts can be adjusted by placing washers or shim stock between rear of engine and firewall, which proves very satisfactory. If steel beam mounts that bolt against firewall are used, they can be adjusted like the radial system; however, this type of mount increases engine "overhang" which causes much more strain on firewall and also gives engine more chance to vibrate. To sum up this engine mount, it should be strong, easy to make thrust adjustments, and must permit a minimum amount of vibration.

As far as construction goes, again, "make it light on yourself"—build something easy. My fuselages are sheet balsa construction with some internal bulkheads to prevent buckling—that's all. I build this because it is, I believe, lighter for its strength. These fuselages on gas models must be strong and resist twisting if you expect to hold any adjustment at all. Try this with your model: put it together as though you were going to fly it and have someone hold wing about half-way out on each side; then you grasp each side of the stab and twist. If, when you give it this "acid test", you can't move the wing and tail relationship with something like a one pound force for ".19" jobs it should be all right. This experiment will show that wing and tail platforms are holding the surfaces and that fuselage is not twisting. If you witness twisting anywhere, it is easy enough to correct it with your mechanical ability and imagination. The sheet balsa fuselage does not lend itself too well for round fuselage construction; however, round fuselages are very little, if any, more efficient than rectangular ones with the very small cross sections now in use. The wood used in my fuselage on ".19" and ".29" jobs is 1/8" medium soft balsa covered with silk or *Skysail*. Hard balsa for fuselages is not desirable because of the extra weight; the little added strength is not usually needed. Occasionally one of the local club members will use 3/16" soft balsa (almost indoor wood) and it does fine.

Another thought I would like to add at this point is that I cement rudder on fuselage permanently. The reason for this is that a more lasting rudder adjustment can be obtained. With a rudder built up on stab it is too easy to get it on a little "cocked" or bump the stab on take-off. With rudder on fuselage permanently, stab must slip through fuselage, be behind (or in front) of rudder (and on top of fuse), or be under rudder located on bottom of fuselage. I have tried all three locations and chose the bottom because the slip through system causes too many split fuselages and broken stabs, along with being weaker, as only the fuselage structure under stab can be used to hold the stab. The "staggered" tail group is all right but aerodynamically is not sound for model work. You either end up with rudder moment too short or stab moment too long, or vice versa. I don't say it can't be used; it can, but it should be done with care and some experimentation. If you care to try this "rudder ahead of stab" idea, let me suggest you start with a rudder a little larger than you would normally use and trim down if necessary; also, I would suggest a nose moment as short as possible, and a warning—beware of "spiral dives" or "spin ins" with this arrangement.

Several times during the life of your model the wing may be called on to support more than five times the weight of the model. If you have a two-pound ship it means that the wing may be called on to withstand forces up to ten pounds and maybe more. For wings on the modern model it looks as if leading edge planking is a must, or a "multi-spar" arrangement. There are many good construction methods in use today, but final result rests with the builder. If you would like to have some figures for comparison, my wings weigh (all finished): 500 sq. in. = 6.25 oz.; 600 sq. in. = 8 oz.+ ; 430 sq. in. = 5.40 oz. These figures are representative of some 90 wings (no, I didn't build them all). I can't say too much about stab construction except that by far the majority being flown are too weak. Build your stab like you would build a wing, but keep it light, if possible.

Just a word or two about covering. Jap tissue has become almost a thing of the past; you just can't get it any time you want to. I like Jap tissue on wings and stabs even for ships up to 900 sq. in. *Skysail* has been used in most places to replace Jap tissue. As far as silk is concerned, it's fine for most any ship, and here is a tip. Department stores sell ladies' pure silk scarves (one yard square) for about a dollar in solid colors or fancy jobs. These scarves are the same silk as the number one grade model silk; they are already colored and are cheaper—what more could you want? While we are in the department store, they sell very light silk handkerchiefs for 39 cents which are 17" square and come in all colors. They make a swell parachute dethermalizer for ships from 400 to 800 sq. in.

(To be continued)

The Columbia

(Continued from page 32)

E. Bossi and P. Invernizzi, two of Italy's early aviation greats, to produce a successful experimental machine. This was a two place biplane pusher powered by a Zust water-cooled engine. During 1909, young Bellanca designed what is frequently referred to as the first tractor biplane. This ship was constructed and successfully flown at Taliedo aerodrome in 1910.

At that time, the Italian aviation industry was ridden with official red tape. Any way he looked at it, Guiseppe M. Bellanca could see little opportunity in his native land. He sought that opportunity in America in 1911, and found the United States a fertile field for his talents. In 1912 he established the Bellanca Aeroplane School, offering instruction in theory and flight, such as it was in those days. He designed and built his own tractor parasol monoplane for use in flight instruction.

When the United States entered the First World War, Bellanca joined the Maryland Pressed Steel Co., Hagerstown, Md., to head up the aviation department. There he designed and built two outstanding light biplanes, models C.D. and C.E. Model C.D. was a single seat light plane powered by an Anzani 35 hp three-cylinder air-cooled engine. Spanning 26 ft., and 17 ft. 6 in. in length, it weighed only 775 lbs. fully loaded, had a top speed of 85 mph, climbed 820 f/p/m. It could maintain horizontal flight with engine throttled to an output of only six hp! Model C.E., an enlarged version with a 55 hp Anzani radial, was a two seater with a top speed of 101 mph and a landing speed of only 38 mph. Both biplanes exhibited unusual performance on low power because of their aerodynamic cleanliness.

It was this same type of clean design that characterized Bellanca's next airplane, model C.F. This was a five place, high-wing monoplane in which the four passengers sat in a comfortable enclosed cabin below the wing. The pilot, true to the tradition of the day, was stuck out in the open, in a cockpit behind the cabin and just to the rear of the wing trailing edge. To give him some visibility over the wide, flat-topped fuselage, the cockpit was off-center to the left. He could at least see what was going on below—on the left side.

This was constructed at Omaha, Nebraska, in 1922 with funds supplied by Victor H. Roos and others of that city. The Roos-Bellanca Company then was formed for anticipated production of the ship. Although this dream did not materialize, the prototype C.F. did prove its worth by winning some 13 prizes for flight efficiency at various air meets.

A particular feature of the Bellanca C.F. was its wing struts, built with a wide chord and an airfoil section to contribute life. This strut form was put to practical use in 1923 when Bellanca formed his own company at Farmingdale, Long Island, to rebuild standard Liberty De Havilland 4's into mail planes. In the process, the heavy Bellanca struts were incorporated to replace the usual flying rigging of the De H.

During this period, Bellanca toyed with designs for a new cabin monoplane based on the C.F. He was thinking in terms of a ship powered by a new engine, then being developed by the Wright Aeronautical Corporation at Paterson, New Jersey. This was model J-5, a nine-cylinder radial, which eventually proved to be a most outstanding engine and was used to power many record breaking aircraft. It was an engine with which Wright, once and for all, hoped to prove the superiority of the air-cooled radial type over the liquid-cooled types which in 1924 still dominated the commercial engine market. Actually, the Wright J-5, based on designs of Charles Lawrance, held the answer to the low-powered multi-place light transport and private airplane.

Bellanca's thought about the new Wright engine in terms of a bigger and better airplane was prophetic. A happy coincidence—while he was dreaming of such an engine, the Wright organization was looking for an airplane in which to prove their powerplant, a sort of flying test bed.

An agreement was entered into whereby Bellanca would design and build an airplane to take the Wright engine. The airplane, designated "Wright-Bellanca" was completed early in 1925. It was a cabin monoplane in which crew and passengers were entirely enclosed. At the 1925 National Air Races, at Mitchell Field, it won the highest efficiency prizes for commercial airplanes.

So encouraged were the Wright people that their engine, in combination with the Bellanca monoplane, would be a world beater, they commissioned Guiseppe Bellanca to design an improved version which was produced in 1926 and designated model W-B 2.

This new model was completed just in time for the National Air Races early in September, 1926, at Philadelphia. It was only slightly larger than the 1925 Wright-Bellanca and had a conventional landing gear in place of the highly streamlined undercarriage of the earlier plane. According to information released by the Wright company at the time, Model W-B 2 had a wing span of 46 ft. 6 in., and a chord of 6 ft. 7 in. Its overall length was 26 ft. 9 in., and height, 8 ft. 9 in.

Designed as a six place general utility transport, the W-B 2 had side-by-side dual controls for pilot and co-pilot, and two pairs of seats aft for four passengers. It carried quite a sensation arriving at the Races the first day piloted by C. C. Champion, especially when all six passengers piled out. In the free-for-all Independence Hall Trophy Race, the W-B 2 placed fourth in a field of nine ships including some hopped up entries.

The W-B 2 also won both efficiency races hands down. The first was a payload race in which the Bellanca carried a load of over 1,292

lbs. over the 120-mile course at a speed slightly more than 121 mph. The Detroit News Air Transport Trophy, also with payload, was won at 121.5 mph.

The aircraft world naturally was curious about this large, standard, low-powered single engine transport monoplane that bested even specially built types. There was nothing more to it than Guiseppe Bellanca's genius for designing in a clean, straightforward, manner. The fuselage was made of chrome molybdenum tubing in three sections.

First was the motor mount section forward of the firewall. This unit weighed just 13-1/2 lbs. It was hinged to the fuselâge in such a manner that it could be swung out and to one side, permitting work on the engine without removing either engine or cowling. Only the fuel lines, engine controls and engine instruments had to be disconnected. Even the oil tank was attached to the hinged mount.

The second section included everything from the firewall to the rear of the cabin. This section was built up on a double Warren truss system that eliminated cross bracing or other structural obstructions in the cabin. Cabin capacity was 140 cubic feet for passengers or cargo. Seats were quickly removed. Because the W-B 2 was used on many cross-country demonstration flights, it was well instrumental. On a neat panel before the pilots were a tachometer, altimeter, bank and turn indicators, drift indicator, watch, airspeed indicator, lateral and longitudinal inclinometers, earth inductor compass and magnetic compass. Standard engine instruments and controls were fitted.

The third, or aft fuselage section, carried the empennage and was attached to the second section by four steel pins.

The constant chord monoplane wing was made up of two solid spruce spars of an "I" section, and ribs of spruce, basswood and balsa. Although ribs had been tested to over 800 lbs. before breaking, they weighed only 12 oz. each. Unbalanced ailerons were controlled by push-pull tubes within the wing. External bracing consisted of two wide chord struts on each side. These were made up of "I" sectioned birch spars with spruce and basswood ribs. The strut airfoil was a medium lift type, sufficient to carry the weight of the struts. The pronounced dihedral thus formed added measurably to the airplane's stability. Struts, like the entire ship, were fabric covered.

The tail assembly was built up of spruce, basswood and ash with fabric covering. The rudder was balanced but the elevator was not. The horizontal stabilizer was adjustable in flight and its airfoil was a non-lifting type. Normal fuel, 64 gallons, was carried in two welded sheet aluminum tanks located in the upper wing stubs. Fuel was fed to the engine by gravity.

As a six-place commercial airplane, the W-B 2 weighed 1,850 lbs. empty and 3,454 lbs. fully loaded. Power loading was 17.2 lbs., and wing loading 12.7 lbs., according to the manufacturer. Top speed was listed as 130 mph; cruising speed, 110 and landing speed, 47 mph. The initial rate of climb with full load was 930 f/p/m.

A number of pilots and planes stood poised to fly from New York to Paris in the spring of 1927. The Bellanca W-B 2 because of its outstanding performance on low power, was naturally one of them. The incentive was a prize of $25,000 posted by Raymond Orteig for the first pilot to negotiate the trip.

By this time, the W-B 2 had been acquired by Columbia Aircraft Corporation, hence the ship's popular name, Bellanca *Columbia*. It was the April 12 to 14 record endurance flight that convinced the new owners the plane could make the Atlantic crossing. In setting this record, the W-B 2 flew a straight line equivalent of 4,080 miles. By May, 1927, the Chamberlin and Acosta team had fuel curves worked out, the plane in tip-top condition.

They waited for good weather for the take-off for Paris.

But while they were waiting, a young man named Charles Lindbergh took off one morning, without fanfare, and stole their thunder. This event lost part of the backing for Chamberlin and Acosta. A wealthy salvage dealer named Charles Levine, however, saved the day. He was willing to help with the financing in return for the honor of being the first passenger to cross the Atlantic by air. His offer was accepted and Acosta withdrew.

The W-B 2 was ready and waiting. For the transatlantic flight, the cabin chairs had been removed and replaced by a huge 326 gallon fuel tank. On top of it were placed 13 five-gallon cans of gasoline—65 gallons more. And with wing tanks full—64 gallons—the total fuel supply was 455 gallons.

As the airplane stood poised for take-off the morning of Saturday, June 4, 1927, a small crowd gathered. On a sign on the fuselage that read "New York to Paris", someone had painted out the word "Paris". The flight now was a matter of principle. The fuselage still carried the racing number "140" used at the previous year's air races, and a notice that the flight was under the auspices of the Brooklyn Chamber of Commerce. The figure of Columbia had been painted in colors on the upper part of the rudder. Also there was the license number NX 237.

Shortly before 6:00 am, Chamberlin and Levine climbed aboard, warmed up the engine and started down the runway from Roosevelt Feld. The airplane now weighed 5,450 lbs., a considerable overload. About halfway down the field, Chamberlin throttled back, turned the plane around and came back to the starting place for a few words with the ground crew. He then nosed down the runway again, advanced the throttle and began his memorable flight. As the W-B 2 gathered speed it groaned off the ground. Slowly, Chamberlin coaxed the plane into the air, set a course on the Great Circle route. Few people knew it at the time, but the destination was Berlin, Germany.

Shortly before midnight Sunday, June 5, Chamberlin found himself short of his goal and about out of fuel. He landed at Helfta, Germany, but history had been made. The first flight from the United States to Germany had been accomplished. The first transatlantic passenger–Levine–had been carried across by air. The crew and plane reached their destination a few days later after waiting for weather. They received a tremendous greeting in Berlin where thousands of people had come to welcome them.

Ideas For R.C.

(Continued from page 34)

has a short length of brass tubing for a bearing. Around magnet itself is bent a brass box with open ends just large enough for magnet to rotate freely. This box is wound with magnet wire and, when a battery is connected to coil formed by magnet wire, resulting electromagnetic field will react on magnetic field of permanent magnet causing magnet and shaft to turn 180°. If battery connections are reversed, magnet and shaft will rotate back in opposite direction 180°. In order to operate the "actuator" in the plane, two sets of batteries must be used as in Fig. six. One set turns actuator one way and another set turns it the other. When I made my "actuator", I wound two windings on it at the same time. Now "actuator" can be connected as in Fig. seven with one winding turning it one way and another turning it the other. One set of batteries is all that is necessary to operate it. I found with one winding type of "actuator" one set of batteries usually run down before the other, causing uneven pulses. Using the two winding type "actuator" with one set of batteries, pulses remain even to the last usable amp of current. Eliminating one set of batteries also reduces weight of radio equipment. In one plane I used the same set of batteries for the "actuator" and for ignition on my engine. Thus, when batteries became too weak to operate the engine it was a warning signal to change them and this prevented rudder failure also.

I next decided to try to figure out a way to operate a second control from the same receiver without affecting operation of first control. I found that increasing speed of pulses did not effect operation of my first control, which was on the rudder, so I set out to devise a control that would work on change of speed of pulses. Fig. three shows circuit I ended up with. An "ouncer" output transformer is connected by its low ohmage winding in parallel with actuator winding. Pulsing voltage in primary of ouncer transformer sets up a low A.C. voltage in the secondary. This A.C. voltage is rectified by 1N48 diode and filtered into D.C. by 100 m.f. electrolytic condenser. This D.C. voltage is fed into grid of 2E36 tube. Filament of 2E36 is connected so that positive side of filament battery is connected to grid. Grid thus has 1.5 volt positive potential on it from filament battery but signal from pulser to grid is of negative potential and nearly cancels out filament potential on grid. Thus potential on grid is about zero, which is the normal operating grid bias of this tube. Tube at zero bias has about one M.A. plate current, which is plenty to operate the 8000 ohm relay connected in it. If pulses are increased in speed, transformer action increases voltage to grid of tube. Since this voltage is of negative potential it makes grid highly negative, causing it to cut off plate current completely. Plate relay deactivates operating the second control in your plane. The same batteries that operate radio also operate second control. All that is needed is an r.f. filter as shown in Fig. three, connected in filament of second control. This filter prevents interaction between second control and radio receiver. RFC choke coils are 1/2 watt two megohm resistors wound with #32 enameled wire. Size of resistor in grid circuit is very critical as it determines amount of negative voltage fed to grid at both low and high speed pulses. A 25,000 ohm potentiometer can be used here to determine size of resistor needed. It can either be left in circuit or replaced with a suitable size fixed resistor when correct resistance is determined. Resistor in my set is 6800 ohms but this may not be true in all cases because voltage of battery source for actuator winding, resistance of actuator winding, and speed of high and low pulses all effect size of this grid resistor.

It is best to experiment with the individual set and get the size that works best. To determine the size resistor needed, an M.A. meter is placed in plate circuit of 2E36 and receiver is caused to pulse at low speed. Reduce resistance on potentiometer to as low a value as possible and still have M.A. meter read one M.A. Increase pulses to high speed and M.A. meter should drop to zero. If it does not, resistance is too large. Continue adjusting potentiometer till you obtain above M.A. readings. Then measure amount of resistance on potentiometer and replace it with a fixed resistor of same ohmage. Other than this resistor, set is not at all critical and once proper size resistor is found, there are no further adjustments ever to be made. Since plate current is either one M.A. (low pulses) or zero M.A. (fast pulses) adjustment of relay is not at all critical. It takes only a fraction of a second of high speed pulses for relay to operate second control is almost instantaneous.

It was now necessary to be able to change speed of pulser at will. This was done by including a second smaller electrolytic condenser in pulser and a single pole double throw micro switch on control box. Fig. four shows how this switch was connected so that when it is de-

(Continued on page 44)

pressed the 60 m.f. electrolytic condenser is disconnected from circuit and 10 m.f. electrolytic condenser connected in its place. Thus, it is possible to change from low pulses to high pulses instantaneously merely by depressing switch. Three-conductor cable between control box and pulser was changed to a five-conductor cable to take care of wires needed for button working pulse speed changing control.

I reasoned that since plane flies in climbing position normally, all the elevator I need was down elevator. I connected a Control Research escapement so that one off position gave neutral elevator and the other off position gave down elevator. That way, I did not have to keep track of sequence of escapement as elevator was either neutral or down. If I had connected it to give up and down, and neutral, I would have had that same old trouble of trying to remember what position it was going to enter next, up or down. I find that down elevator alone is very adequate anyway. It helps immeasurably in doing violent maneuvers.

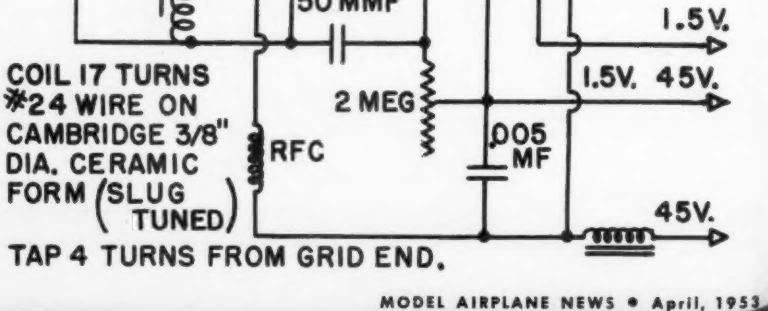
My last contribution is a radio receiver that can be used with any kind of control, escapement, pulse, time interval or what have you. The big bug-a-boo in radio control has always been the receiver. It is easy to put a transmitter together and make it work but receivers have always been tricky. This receiver eliminates all tricky adjusting both, during building and after it is built. Once constructed, tuned to frequency and with relay adjusted, you can forget adjustments from then on out. Antenna can be any length, plate current does not have to be adjusted and you can forget antenna tuning and feed back adjustment forever. Receiver uses three tubes, which may be objectionable to some, but weight is only four ounces and tubes are easy to obtain, have a very long tube life and are not effected by a little excess plate current. Most radio receivers in use today are either critical to adjust or else have an expensive tube with a very short life. Although receivers using an RK61 tube are easy to construct, tube is very short lived and receiver itself needs constant adjustment as tube ages. This means adjustment before practically every flight and also possibility of receiver going out of adjustment during a flight, which would leave you high in the air with no control. Receivers using a single 3A5 tube work perfectly and have a long tube lift but it is practically impossible for the average layman to construct one and make it work successfully. A factory made 3A5 receiver is ideal as far as operation goes but they too have a critical antenna length adjustment. This antenna length must be readjusted as battery voltage goes down. Other multiple tube receivers that have been described are very sensitive and work fine but are made to operate on a modulated carrier wave, so naturally transmitter and also receiver operating circuit is more complicated. It requires a modulating circuit in transmitter and a resonant circuit of some kind in receiver to respond to audio modulated signal. These receivers will not operate on a plain C.W. or unmodulated signal such as is put out by most transmitters on the market today.

Receiver shown schematically in Fig. eight operates perfectly on C.W. and will tune anywhere in six meter band. There is approximately a two M.A. or better change in plate current when signal is received which makes relay adjustment easy. Receiver idles at approximately two M.A. and jumps to approximately four M.A. on receipt of a signal. These readings may vary slightly, depending on individual receiver and tubes, but differential remains the same, two M.A. I used plastic for a chassis on one receiver and sheet metal for a chassis on another. Each set worked equally well. Chassis is 1-3/4" x 5" x 1/8" and components are arranged as shown in Fig. nine. I used a Sigma 5F relay on one receiver and a Sigma 4F relay on the other and both are excellent. All components are clearly shown in Fig. eight and schematic is practically self-explanatory. One word of caution: be sure filaments are connected as shown, as filament battery furnishes proper grid bias for correct operation. Sketch below shows 27 conversion.

You will notice that relay used has an 2000 ohm winding. If you purchase your relay direct from Sigma Instruments, Inc., 70 Ceylon St., Boston, Mass., you can order size winding you want. Many times Sigma 5F relays can be purchased very cheaply from war surplus suppliers. These surplus 5F relays have 8000 ohm windings but, since there are two coils of 4000 ohms each hooked in series, it is an easy matter to change hook up so coils are in parallel and this gives 2000 ohm resistance needed.

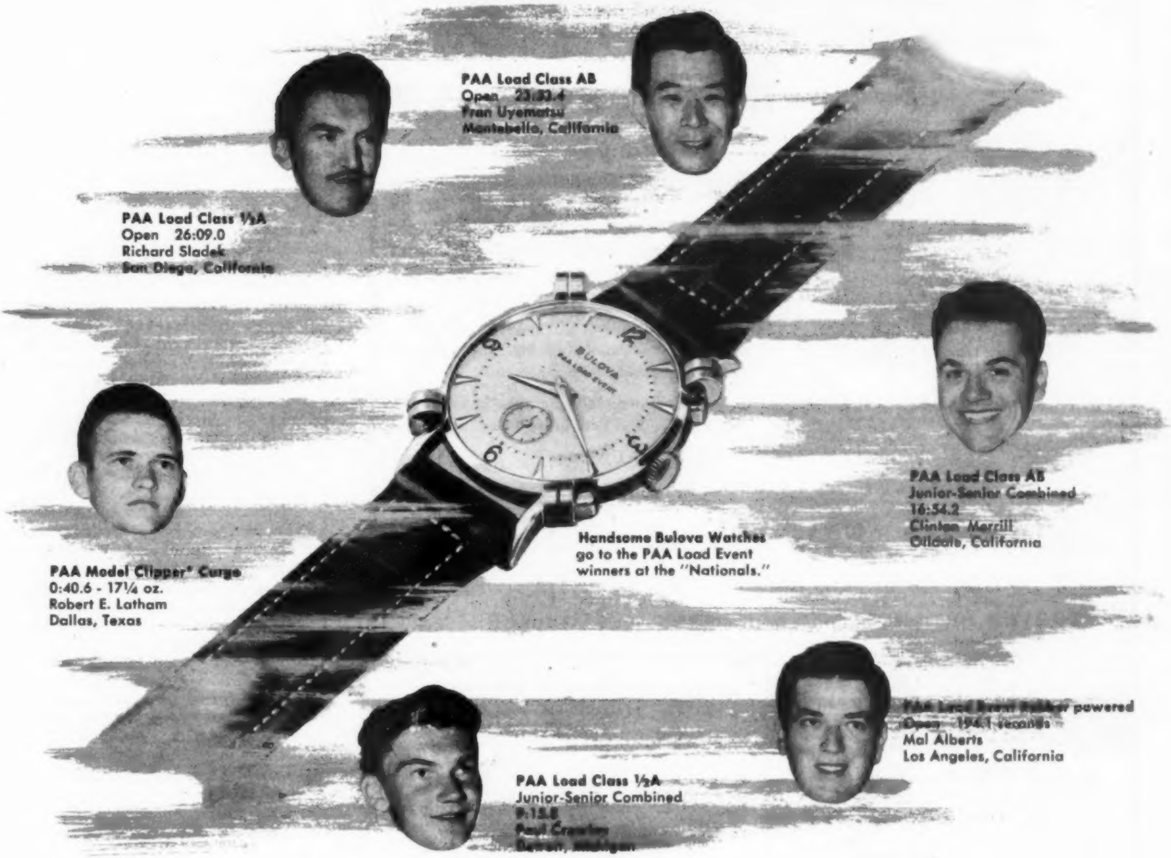
It is best to adjust relay to operate at about half way point or three M.A. A greater differential in plate current can sometimes be obtained by replacing five m.m.f. condenser in antenna with a three to 13 m.m.f. ceramic trimmer condenser. This antenna trimmer is adjusted to obtain lowest possible idling plate current. In most cases though, this will not be found necessary. This receiver has been tried with both escapement and pulse type controls and worked fine with both. I myself prefer pulse control as you can get much better precision flying.

27 MC ADAPTION FOR 3 TUBE RECEIVER



Record Racker-Uppers

at the 1952 "Nationals"



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Engine Review

(Continued from page 24)

expected, the problem resolved itself into the question as to whether the saving in friction occurring from the elimination of the rotary disc would offset the increase in friction brought about by the removal of the ball bearing. Performance usually suffers appreciably with this change and, at first, the Forster showed a power loss, aggravated, no doubt, by the inferior qualities of the shaft valve system generally. It was found however, than an alteration from the standard valve timing satisfactorily improved induction over the required range of speed, and the task remaining was the formidable one of improving the crankshaft bearing without making cost high.

The factors to consider in this respect are first, unit and frequency loading in relation to peripheral speed, or simply, shaft diameter and the weight sustained by it in conjunction with rpm and therefore, the frequency with which the load is applied; second, lubrication efficiency; third, operating temperature; fourth, materials used for shaft and bushing; fifth, rigidity and alignment and sixth, surface finish and hardness.

The first consideration has been established by long precedent to be adequately handled with the size of shaft normally fitted to most .29's including the earlier Forster engines, that is 3/8" diameter for all normal speeds. The second and third points are well taken care of by the admission of cool, oily fuel through the shaft rotary valve. The fourth factor is settled by strength considerations in that the shaft has to be made from a tough, impact resisting steel, and the bushing from an inert, hard wearing bearing material, and in this case, phosphor bronze was the designer's choice. All of these foregoing features are common to many engines, and have proved satisfactory. It therefore, devolves on the last two factors to give the extra efficiency to make the plain bearing Forster produce a performance comparable with the G-29 engine which is similar except for having disc valve and ball bearing.

Careful study of shaft behavior showed that the usual procedure of machining, heat treating and final grinding had two imperfections. One was the slight distortion, produced by drilling the rotary valve port, being to some extent reproduced by chatter and wheel bounce in grinding, and second, was the surface finish of both shaft and bushing being variable and affected by tool and wheel wear, with consequent variation in engine performance. If, however, a super surface finish could be consistently produced that would leave both shaft and bushing absolutely round and parallel, an unusually high standard of engine should result; as any engine manufacturer will tell you, the usual reason for the difference between his best and worst performers can be found in the crankshaft bearing, so it is not altogether surprising that, having adopted a super finishing process, Forster Brothers can claim that the F-29 equals the performance of their more complicated G-29. This feature of hardened, super finished shaft and phosphor bronze bushing is also extended to conrod bearing and crankpin in this engine with consequent benefits in extra life and performance.

Forster thoughtfully supplies mounting bolts and raising blocks for crank center line mounting. A box wrench that fits plug and prop nut is available at extra cost. This is of such a size that one cannot seriously overtighten either fitting.

There are small refinements of detail such as the aluminum prop driving disc which is unusually rugged and seats on a positive taper, thus eliminating that common and extremely annoying trouble of a bent or slipping drive. The carburetor unit screws into the bearing housing so that it may be located in any angular position convenient for needle valve manipulation and is held in position by a locknut.

The spraybar screws into tapped holes in the intake, and also has a locknut on either side, thus making it well nigh impossible for the spraybar to vibrate loose.

A common fault with many engines, particularly of foreign make, is that a heavy crash can knock the shaft back and damage the conrod and crankcase. This hazard is prevented in the F-29 by an accurately placed snap ring set in a groove at the front of the shaft to butt up against the bushing.

Many will recall the outstanding lapped piston fitted to the old .29 which had brazed-in wrist pin bosses and tiny circlips to retain each end of wrist pin. The F-29 preserves this neat method of retention and to avoid the necessity for excessive cold piston clearances common to ringed engines, employs a low expansion alloy piston which has the ground finish hitherto only associated with the finest racing engines. The ring gaps and groove clearances are also very fine, with the result that compression, even when cold, is comparable with that of a lapped unit. Although it is impossible to truly balance any single cylinder engine, the Forster produces remarkably little vibration for its size.

The cylinder is held down by the usual Forster method of four inverted screws at the port belt flange, and the head by a further six screws. The bearing housing is retained by three long screws which protrude through clearance holes in the crankcase into tappings at the rear, thus permitting radial mounting by fitting longer screws, and the prop is secured by a special steel nut and washer on a 1/4" dia. thread.

When examining an engine for the first time, we automatically begin speculating as to the ideal model and type of competitive activity in which that motor would excel and, in the view of the writer, the F-29 is an ideal choice for team racing for the following reasons:

The position of the mounting lugs relative

to the crankshaft center-line would make a permanent inverted beam mounting setup, and its inherent strength, very practical because the amount of engine exposed by the removal of the upper cowl is more than adequate to allow complete engine overhaul without removal from the airplane. The available room beneath the lugs would permit the use of very strong engine bearers, the underside of which would be in a convenient position for wing attachment and control assembly. The tank would sit between the bearers and rest on the wing center section, thus locating it close up behind the engine and in a good position in relation to the jet, giving very slight gravity feed on a full tank with the tail on the ground, thus facilitating fast starting without choking. The exhaust, incidentally, would point out of the circle which helps the mechanics to assess the mixture setting in flight. The intake, while not perfectly located for painlessly choking a hot engine, is in the best possible position for getting fresh cool air in spite of scale type cowling; choking is seldom necessary with an experienced mechanic.

This type of installation would result in a model with a very short nose and landing gear immediately beneath the engine. The engine being close to the wing enables the after part of the fuselage to be short and light in order to achieve the correct center of gravity position, and also allows a heavier and stronger wing leading edge to be tolerated without exceeding the normal team racer all up weight. There would be little tendency for the model to nose over in the roughest ground, and the low nose movement would give excellent control response and stability.

On the score of performance, you would have easy starting owing to the fine piston fits, and good torque for fast take-off owing to the bore/stroke ratio and absence of low speed piston leakage. Also you would not waste fuel from carburetor blowback, as in the case with racing engines at low speeds. In the air, you could expect to get around 85 mph, which, although slightly lower than that of racing engine jobs, will matter little because the trump card of the F-29 lies in gas mileage. Giving you 25 per cent more laps per tank than an average racing engine, the Forster will save one pit stop in a ten mile race, which means at least ten seconds saved plus the usual refueling hazards, and gliding in and accelerating up to speed again.

TEST: Forster F-29—Plug—Ohlsson Racing Long Reach, as supplied (1-1/2 volts to start); Fuel—Supersonic 1000; Running time prior to test—2-1/2 hours; Bore—.750"; Stroke—.672"; Weight—5-1/2 ounces.

Power Prop	*RPM*	*Top Flite*	*RPM*
10 x 8	9,000	10 x 8	8,500
10 x 6	10,400	10 x 6	9,800
9 x 8	10,600	9 x 8	10,100
9 x 6	12,500	9 x 6	11,600
8 x 8	12,750	8 x 8	11,900
8 x 6	13,700	8 x 6	12,800
7 x 10-1/2	12,650		
7 x 9	13,900		
7 x 8	14,900		

In spite of a total time logged, including the test, of over four hours, this engine still did not seem to have thoroughly settled down. Although the figures are remarkably good, particularly in the higher speed range, there was a tendency towards inconsistent performance in relation to the load. Where it was giving good results on one prop it did not give such good preformance, relatively, on another. This is usually a sign of overheating, and subsequent examination showed that the piston was still in the process of running itself in, the bearings being by this time in ideal condition. This is not a fault. It is probable that, with more running, an even better all round performance will follow. Compression and starting were excellent whether hot or cold. Needle valve response and general behavior left nothing to be desired. END

Double Feature

(Continued from page 16)

music wire for rubber. J-Bolts can be used to fasten it to firewall.

Once basic structure of the fuselage has been completed, then add minor details such as mounting pegs, fairings and dethermalizing hooks. Nose block (for rubber only) can be carved from a single piece of hard balsa, or should you prefer to spend a little more time, it can be made up of 1/8" sheet balsa laminations.

Construction of wing is exceedingly simple. Start by cutting all ribs. Since there is no spar, we have built the dihedral into leading edge of wing. Construct leading edge to include dihedral angle, then start construction of wing.

Beginning with one of the center panels, cut 5/32" x 3/4" tapered trailing edge to size and notch to take ribs, then pin it in position on plans. Leading edge is also placed in its respective position on the plan, after which ribs are cemented in their respective positions. If a sheeted uppercamber is desired, it should be cemented in place prior to removing wing frame from plan. Since sheeting is only 1/32" thick, it is advisable to use "C" stock to prevent possibility of sagging after the covering and finish have been applied.

Follow through with same procedure for completing remainder of wing structure. Sand surfaces with a fine grade of sandpaper, rounding off leading edge and wingtips.

Stabilizer is constructed in same manner, with exception of dihedral, which is not used. Rudder is cut from 3/32" medium sheet balsa, while tip plates are cut from 1/16" hard sheet balsa. They are then sanded to a streamlined shape with coarse and fine grit sandpaper.

In covering wing and stabilizer, have paper running spanwise, as this will minimize sagging between ribs. In covering fuselage, paper should be applied with grain running the length of the model.

For an adhesive, we suggest a 50-50 mixture of cement and dope. Once all surfaces have been covered, spray them with water to tighten paper. While surfaces are drying, check for warps. Warps can be removed by untwisting wing to correct alignment and holding over a hot air supply until paper has dried.

For covering material, use tissue for the rubber powered version. Lightweight *Silkspan* is recommended for the gas powered version.

For a finish, apply three to four coats of thinned dope to all surfaces. Add two coats of fuel proofer for the gas version.

There is much that can be said about carving and assembling a rubber powered, folding propeller assembly. We've endeavored to illustrate those features that might give trouble. The block should be of medium hardness and light weight. Mark off dimensions shown on plan and cut out the propeller blank, either with a coping saw or a sharp knife. Complete operation by sanding with coarse and fine grit.

Commence carving the blade(s) on forward face of propeller. Using a sharp knife, remove slivers of balsa until desired uppercamber has been roughed out. After forward face has been completed, follow same procedure for the under face. However, don't carve blade(s) too thin for it will be difficult to attain a suitable airfoil shape in the blade(s) when sanded to a smooth finish.

Folding hinge assembly is illustrated in detail on plan. Brass is recommended for use, but any solderable metal with sufficient rigidity will suffice. When binding these units to hub and blade, use a strong thread applied uniformly as shown.

For contest work, where a great deal of slack rubber is to be employed, hook and bobbin assembly shown is the choice arrangement. As for power, 16-18 strands of 3/16" brown rubber, 28" long, or 12 strands of 3/16" Dunlop rubber will suffice. Lubricate motor with a 50-50 mixture of tincture of green soap and glycerine.

For gas, bolt engine to firewall, in position shown. Since our engine features an integral tank, we used a fuel cut-off timer. If your engine does not feature an integral tank, a glass eyedropper can be used for both fuel container and engine cut-off.

Before flying, check model for balance. Center of gravity position should be about 25 percent forward of wing trailing edge. If it appears to be way out of line on your model, alter rubber motor to suit condition or use a little ballast in the gas version.

Place a small mark on both wing and tail leading and trailing edges, when correctly aligned on fuselage. Identical marks are then placed exactly opposite on fuselage; thus whenever wing and tail are out of alignment, they can be shifted back to desired position.

Before attempting a power flight, whether gas or rubber, check glide. If there appears to be a shallow turn in either direction, do not make any further turn adjustments. If not, then make a slight adjustment in whichever direction you prefer model to glide. Strive for a noseup tendency in the glide and, if necessary, increase incidence under wing.

There are several precautions that should be taken for the first few flights. Use a short motor run and propeller of your choice, keep rpm down by maintaining a rich fuel mixture.

If there is a tendency to loop under power, control it by employing downthrust in the engine. Many modelers prefer to control this tendency with tight turn adjustments.

The design of the model is such that it allows for a wide range of adjustments.

BILL OF MATERIALS

(Balsa unless otherwise specified)

1—1/4" x 1/4" x 36" (hard)—wing leading edge. 1—5/32" x 3/4" x 36" (med.)—wing trailing edge. 2 — 1/16" x 3" x 36" (med.)—wing ribs, stab ribs, rudder tip plates. 1—1/8" x 3" x 18" (med.)—wingtips, rud-

der, fill-ins, gussets. 1—3/16" x 3/16" x 18" (hard)—stab leading edge. 1—1/8" x 5/8" x 18" (med.)—stab trailing edge. 4—1/8" x 1/8" x 36" (hard)—fuselage longerons, wing runners. 4—1/8" x 1/8" x 36" (med.) fuselage crossbracing. 1 — 1-5/8" x 1-3/4" x 8-1/4" (med. soft)—contest prop. 1—7/8" x 1-3/8" x 11-1/2" (med.)—sport prop.

.063" dia. wire for prop shaft, .049" dia. wire for landing gear strut, .049" I.D. tubing for landing gear, rubber for motor, thread, wheel, cement, dope, tissue paper or silkspan, 1/16" plywood, 1/2 "A" or small "A" engine for gas version.

The Truth About C.L.A.

(Continued from page 18)

the areas which you see there so that they are centered on a horizontal line passing through the center of gravity. This is supposed to equalize the side forces acting on the airplane, so that any side gusts or sideward flow of air will not upset the ship.

The idea seems quite plausible, and when explained in a scientific manner, it sounds convincing. As a matter of fact, it reads so well that it throws into confusion many expert modelers who feel strongly from their experience and observation that something about it is wrong. The only thing wrong is that it just doesn't jibe with the facts of flight.

Before we look into the facts of flight, let's ask a simple question. Why don't most models incorporate the idea of low CLA? If it really is the best system, it stands to reason that with all the articles and publicity it has had in the last 13 or 14 years, it should today be an essential part of the design of most record-breaking models. Yet there appear to be less models than ever which even try to incorporate low CLA. The reason is it simply doesn't stand up to the test.

No model which actually used the idea behind low CLA could fly in ordinary free flight for this reason: if you neutralize the forces produced by sideward flow of air, you *remove the lateral stability.*

Lateral stability in a free flight airplane is its ability to set up forces to counteract a bank. These forces are taken from the sideward flow of air which is obtained in a bank. They try to lift the lower wingtip until it is level with the other tip. A free flight model needs the ability to set up these forces so that it can recover whenever its flight is disturbed. Even an indoor model, flying in perfectly calm air, must have lots of lateral stability because *it takes care of the torque,* too.

The importance of lateral stability and the way it works is simple and easy to understand. Just ask yourself, "Why do I put dihedral in my wings?" The answer, of course, is to stabilize the model sideways (lateral stability) so that, if one wing dips down due to torque or wind, that wing will develop more lift than the wing which is high, and counteract the bank. The illustration shows how this works, and the direction of the counteracting force.

Looking at the illustration, note the addition of a pylon, making a so-called high CLA. Notice the direction of the force created by the air acting on the pylon. It is the same direction as the corrective force acting on the wing and simply adds to it.

Notice that when the fin is mounted low, the direction of the force on the fin is OPPOSITE to the corrective force of the wing, and *subtracts* from it! If you make the fin large enough, you can completely neutralize the stabilizing action of the wing, and thereby eliminate your lateral stability!

That's actually about all there is to the main point of the question of high or low CLA. However, there are some very interesting side considerations. For instance, take a look at the

size of the bank-correcting force which the wing can deliver. The leverage of the wing-tips multiplies the corrective forces, so that it would take a huge fin to counteract them completely.

That's why models can fly even though they are designed to have low CLA. Their side *areas* may be balanced, but their lateral *rotational forces* are not. Low CLA merely reduces the corrective forces of the wing. You practically never see low CLA in contest models, simply because they can't afford to reduce their lateral stability.

Mr. Raoul Hoffman of Chicago pointed out years ago that the only importance of a flying surface is the force it produces. One may balance the side areas by finding the center of a side view cut-out, but it is quite impossible to find the center of the side forces by their areas. And the forces produced by the side surfaces and the wing *are constantly shifting*.

The low CLA theory speaks of balancing side areas on a level with the center of gravity. However, these areas mean little; only the forces they produce count. The shape of an area greatly influences the force it can produce. Not all side areas have the same shape. For example, the side view of a fuselage is much different from a rudder, the side forces on a fuselage are much lower per square inch than those on a rudder. Yet the CLA theory treats these shifting and unequal forces as being stationary and all of the same value per square inch.

The crowning and crushing thing, of course, is that if anyone ever really did balance the side forces so that they passed through the fuselage on a level with the center of gravity, there would be no lateral stability left!

In concluding, I'd like to mention an entirely different design factor which has a definite effect on lateral stability, but is seldom considered. This factor is slip resistance. A model with plenty of side area for its weight has much natural resistance to slipping sideways. When a sideslip takes place slowly, the lateral stability has more time in which to restore the ship to level flight, before disaster strikes.

In a nutshell, the more side area, the less critical is the lateral stability. END

Man At Work

(Continued from page 8)

Years final standings of *Western Associated Modelers* clubs and individuals, courtesy Pop Robbers, shows 62 member clubs (counted 'em). Top dog in speed: *Hell's Angels* of NAPA; Proto: *Aero Modelers* of Alameda; Advancement: Newark *Model Busters;* Stunt: Newark *Model Busters;* Beginner Points: *Capital Screamliners.* And speaking of Control Line Endurance, Bernice Jaynes did 1,904 laps in about 3-1/2 hours. MAN's favorite of the club names: Sacramento *Shmoocontrollers.*

* * *

"Terrific," said Irma Hillegas, of Cleveland's Second Annual Air Meet (the biggest indoor meet in history) in the Public Hall, 120 feet long and 90 feet high. Three-way bigtime sponsorship by Cleveland Coco-Cola Bottling, Cleveland *Press,* and City Recreation Division, resulted in over 400 contestants who flew 1,000 planes before 15,000 spectators. High point champ, Ronald Brich. Smart work in setting up events put this one over: "prefab rubber power for dodoes, bantams, and fledglings"; paper covered duration, microfilm duration, hand-launched gliders.

* * *

In its sixth year and still going strong, under the presidency of Bill Kleinhas (AMA #101), *Air Whirlers* (Ken Ballard, ABC Hobbycraft, 6th & Vine St., Evansville, Ind.), invite all hands to annual meet. Club has three permanent circles at local airport and, though specializing in U-control, has a monthly contest including rubber, free flight, gliders, and rc. On their toes, the *Air Whirlers* had ten contests on consecutive Sundays last summer within 100 miles of Evansville.

* * *

Every first and third Monday night, the up and coming Vancouver *Glo Bugs* meet at Harry's Bike and Key Shop. Prize for ship with best workmanship displayed at each meeting. Lectures and movies popular. Discussion of new ships. Aimed at teaching members the basic maneuvers in AMA stunt pattern was a series of contests, held every two weeks. First time out, entrants were graded on starting, take-off, landing, and level flight. An additional maneuver was added at each contest until the full pattern was performed at the final meet. Winners were graded according to the number of entrants. First place in a field of ten gave ten points, second place got nine, and so on. The contestants total for all meets determined final winners. Future contests are planned for free flight, team racing, speed. "If we expose our members to all phases of the hobby," says Ray Andruss (616 Beech, Vancouver, Canada) "they are more likely to find one that will interest them enough to keep them in the fold instead of turning to stamps or some other diversion."

* * *

Another outfit strong on giving all kinds of modelers a break is the *Skymasters,* (C. M. Ehrhart, 21 So. 5th St., Mt. Wolf, Pa.). Team racing is a specialty but all kinds of ships are on the boards for '53. New members welcome —anyone in York County eligible.

* * *

New York *Aeronuts* announce Long Island Championship Meet, Sunday, June 28. (Gary Garab, 12 Fairview Pl., Brooklyn, N. Y.) Free flight, payload, combined rubber, towline. In the winter the 'Nuts go control line, holding Sunday morning meets at Riis Park. Team racing, too.

* * *

One of the most unusual contests ever held west of the Rockies is the Fifth Annual California Hobby Show (ten days), March 20 in Los Angeles. K & B's Lew Mahieu and Duro-Matic's Keith Storey, will direct the round-robin "Tournament of Champions." Contestants will be limited to place winners in previous contests. "By choosing top-notch modelers and the newest type events, we hope to put on a contest that will stimulate public interest in flying," Mahieu and Storey said in a joint statement.

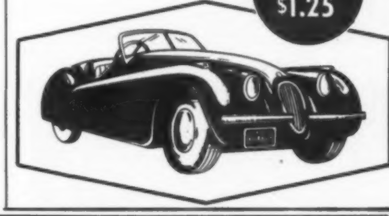
Events will be flown in fenced u-control circle in Shrine Convention Hall, where the show is held. Power events limited to Half-A u-control, planes flown on lines of 22' or less! Competitors will enter four divisions: combat, stunt, speed, and glider. Glider flying is scheduled nightly, to convince the younger generation that they may start flying for only a few cents and still have fun.

* * *

As we go to press, the flying scale committee has reported the 1953 rules, which probably will be approved. These rules differ radically from previous rules, especially in their solution to a fair balancing of scale and flying points, adjusting for the lucky thermal, and other numerous problems. The power loading is 150 ounces. No engine run limitation but there is a flight limit of three minutes. An engine run-flight time ratio determines flight points; these are multiplied by the scale points. You can r.o.g or hand launch, but the figure ten is added to the engine run in figuring the flight ratio. Maximum displacement is .050 but two motors can be used if the individual displacement is not over .050 (.099 total)—but two engines cannot be geared to drive one prop. Engine runs of less than 20 seconds in r.o.g. shall be counted as 20 seconds; 30 seconds for hand launch.

* * *

With the Wakefield finals in England this year, the English have made another change in the rules. The rubber weight is limited to 2.8 ounces, minimum total weight 8.115 ounces as before. Eventually, this change can be expected to result in cleaner, better designs, variable pitch props, and other developments calculated to boost efficiency.



ADVT. INDEX, APRIL 1953

Hot Foot

(Continued from page 12)

plans, paying particular attention to obtaining equal length on each leg. After bending and trimming, fasten gear to fuselage with (3) J-bolts. Solder nuts to bolts after installation, to prevent loosening from vibration.

By the way, ever have any trouble cutting steel music wire and trimming gear ends after bending? Pretty tough on pliers and cold chisels, by golly! Well, here's one way to do it, easily and safely without ruining your tools.

Make a mark on wire with a file where you want to trim and go up to the gas stove in the kitchen. Grab wire with two pairs of pliers, one on each side of file mark, allowing about one inch of wire exposed between pliers. Insert this small exposed portion of wire in gas flame and heat until it glows a cherry red. Remove wire from flame and allow it to cool in the air. *Do not dip wire in water!* In a few minutes wire will be cool enough to handle and may now be readily cut with a chisel, file, or hacksaw without damaging them. Also, and most important, gear will be as lively as it should be. Do not however attempt this method to aid in bending music wire. It will bend readily enough but spring temper will be gone where it's most needed, unless you know how to re-temper wire.

Locate your engine between mounts and bolt in place after adding just a little right-thrust to prevent any suicidal maneuvers in flight. Soldering nuts to a brass plate which in turn is cemented to mounts aids engine removal, so don't overlook it. Cement plywood former F-1 in place after making certain it's aligned parallel with engine drive washer, so that spinner will track properly and not scrape against it.

Make up stab and elevator assembly and cement to top of fuselage. The rudder should also be built and cemented to top of stab, after connecting pushrod to control horn. Check controls for freedom of movement and eliminate any restrictions. The tail wheel assembly should be made up and cemented to former F-8.

Trace outline of cabane struts carefully on 1/8" ply and cut accurately to shape. Sand exposed portions to a streamline shape and cement them securely to formers F-2 and F-4. If these formers were accurately cut and notched, struts will align themselves; if not, make certain they project equally and are square with respect to fuselage before allowing cement to dry.

Before completing fuselage, go to work on wings. Accurately trace outline of wing rib on a piece of brass, aluminum or thin bass wood. Cut this template out very carefully. Using template, trace outline on material specified on drawings.

Select a medium hard and perfectly straight piece of 1/2" sq. balsa and two pieces of 3/16" x1/12" balsa and make up leading edge channel for lower wing. Mark off position of each rib on this channel very carefully and begin assembly by laying leading edge on workbench with open side of "U" upward. Cement ribs in piece of 1/2" sq. balsa and two pieces of 3/16" rib by rib, to opposite tip. Do not cement W-2 ribs or center rib in place at this time. Square up each rib, using a small triangle and sight along assembly to make certain ribs are aligned before allowing cement to dry. The wing trailing edge is made up from two pieces of 1/16" x 1" sheet balsa. Bevel the rearmost portion of each half about 5/16" wide with a sanding block and cement to each side of ribs.

The tips are cut from one inch thick soft balsa blocks or laminated up to one inch from any number of sheets. Roughly carve them to shape and cement to end ribs.

With a sharp knife and coarse sandpaper, whittle leading edge down to shape and blend in with tips. Cut wing in half directly on centerline and bevel cut edges slightly to allow for 3/8" dihedral at each tip as shown. Cut out two dihedral formers from 1/8" plywood and cement two wing halves together, blocking up tips the required amount and adding center ribs and dihedral formers as shown.

Cut down three center panel ribs 1/16" on top and bottom and cover center section of wing with 1/16" sheet. Fill in between upper and lower halves of trailing edge with 1/16"x 3/16" balsa strips, cementing these pieces in place to each rib and trailing edge. Do not install interplane strut (W-2) ribs as yet.

Cover dihedral break on both sides with a strip of nylon or muslin about 1-1/2" wide. This will impart a good deal of strength to wing. The lower wing may now be assembled to fuselage. First, cement 1/8"x1/2" strips across bottom of F-3, F-4, F-5 and F-6. Fit wing snugly into cutout in fuselage and cement in place. Check wing for proper alignment, viewing first from top and then from the front, adjusting if necessary before cement dries.

Let's go back and wind up fuselage. The curved upper portion of fuselage is planked with dead-soft 1/8"x1/4" balsa strips. The side and top of head rest is cut from 1/8" medium hard sheet, cemented to each former.

Soft balsa blocks, 3/4"x1-1/2"x3-1/2" are cemented to each side of rudder and butt against rear of F-8. These blocks are carved and sanded to conform to fuselage cross section and follow curvature of top view of fuselage and fair into rudder at what would normally be called rudder hinge line. Soft balsa tail cone pieces measuring 1/4"x2-1/2/x2-1/2" are cemented to each side of rudder under

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elevators and are also carved to a curved outline and blended into trailing edge of rudder.

Before sanding fuselage, don't forget cowling. It should be made up of three pieces; top is a soft block, 1-1/4"x2-3/4"x4-1/2" and cowl sides are made of two pieces, medium balsa sheet 3/8"x3-3/4"x4-1/2". These three pieces plus 1"x2"x1" soft pine spacer block are spot-cemented to firewall and engine mounts and roughly carved to shape. Take cowl assembly down to finished size with coarse sandpaper and then sand finish entire fuselage assembly after adding wing and stab fillets of plastic balsa.

The cowl sides are made removable as shown on drawings, by cementing hardwood blocks to firewall, holding cowl sides in position with number two wood screws . . . two into engine mounts on each side and one into each side hardwood block on firewall. A single number two wood screw goes through F-1 into soft pine spacer block. The upper wing is built in same manner.

All ribs except W-2 and W-3 are cemented in place. The curved trailing edge at center panel is made by inserting a wedge-shaped, soft balsa block between upper and lower halves of trailing edge and cementing to ribs on either side. Pad this block up with 1/16" sheet until it matches thickness of wing and blends in with airfoil. Rib W-3 may now be inserted and cemented in place.

Wing tips and gussets should be added and entire wing carved and sanded to final shape.

Interplane struts should now be traced on 1/8" plywood and cut to shape. Sand to an airfoil shape and let's start the final assembly.

Lay upper wing on workbench and block up trailing edge so that chord line is parallel with bench. The fuselage should be placed exactly over center of upper wing, with cabane struts resting on bench. Block up fuselage as necessary to get thrust line parallel with chord line of upper wing. Check to make sure upper wing is square with fuselage and that gap, stagger and upper wing overhang are equal.

Now insert all W-2 ribs in approximately the correct position and insert interplane struts. The W-2 ribs on inside of cabane and interplane struts are now cemented in place. *Do not cement W-2 ribs on outside of struts in place yet!* After cement has dried, slip outside ribs in place and bolt thru intersection of each W-2 rib and strut with No. 2-56x1/2 machine screws. When you are satisfied with alignment, remove upper wing by removing bolts.

For maximum strength, entire model should be covered with silk or nylon. If financial strain is too great, *Silkspan* may be used without sacrificing too much. The fuselage, cowl and tail surfaces should be covered with one inch wide strips of whatever material is used.

The original *Hot Foot* was given six coats of clear dope on wings and same number of coats of sanding sealer on fuselage and tail surfaces. Five to ten coats of colored dope of your selection, plus trim, will finish decorating.

The model should now be finally assembled. Cut away covering from underside of upper wing and top side of lower wing where struts are located. Bolt wing in place and cement outside W-2 ribs in place and also squirt plenty of cement between these ribs and struts. Recover where small strips were cut away and finish as before. Run lead-outs thru 1/8" plywood tip guide and form loops in ends. Check all controls once again for freedom of movement. Solder wheels in place and check for smooth running. The model should balance at front lead-out wire.

We suggest that those who intend to use smaller engines would do well to build up stab from 3/16" sheet and strips as shown and to substitute 3/32" sheet for fuselage.

BILL OF MATERIALS

5 pieces—1/8 x 3 x 36" sheet balsa; 4 pieces—3/16 x 3 x 36" sheet balsa; 2 pieces—1/16 x 3 x 36" sheet balsa; 1 piece—3/8 x 3 x 36" sheet balsa; one piece — 1/2 x 3 x 36" sheet balsa; 3 pieces—1/2 x 1/2 x 36" balsa strip; 12 pieces—1/8 x 1/4 x 3 x 36" planking stock; 2 sheets—1/8 thick x 6 x 12" plywood; one sheet 1/16 thick x 6 x 12" plywood; 2 pieces—3/8 x 1/2 x 12" hardwood; 2 blocks—3/4 x 1-1/2 x 3-1/2" balsa; one block 1-1/4 x 2-3/4 x 4-1/2" balsa; one block 1 x 1 x 2" soft pine; one length 1/4" dia. birch dowel; one piece 1/8 dia. x 36" long steel music wire; one piece 3/32 dia. x 36" long steel music wire; one piece 1/16 dia. x 36" long steel music wire; one 3" ballcrank; one package .020 dia. leadout wire; one Veco bellcrank; one pair 2-1/2" dia. wheels; one 1-3/4" dia. Scamper spinner; 6—No. 2 x 5/8" flat head brass wood screws; one package No. 440 engine mounting screws.

Flying Circus

(Continued from page 21)

12 fliers and an announcer for the P.A., when we have one, and four handlers. There are over 35 ships. Over 60 percent are .60 jobs as they handle much better in the wind, although we can put up four .29's in a 25 mph wind.

Planes are painted in light colors and trimmed in dark ones; most don't look like they were built overnight.

It was quickly decided there would have to be one director to call *all the moves* if the ships were to get down in one piece. The director has to have the cooperation of all fliers.

Here are some do's and don'ts: DO—always pass at least five feet above the other flier; always fly below 20, since it is above this zone that you can get into trouble (flying a smaller circle and your getting around just twice as fast); know how long your tank runs and when it is about ready to cut, drop to five feet and you'll be safe to land. When ribbon cutting, you may avoid the attacker only by dives and climbs up to 60 degrees which is a little rough. Know what you are going to do before you start flying. Everything must be premeditated, not an accident. Tell the other fliers you are landing and then leave the circle and get your ship back to the pit. Know the capabilities of your ships and engines.

DON'T—do any maneuver that has not been called for by the director. Pass under another flier. Get out on the circle just to crank your engine. The spectators know how these are started; they want to see them fly. Forget to clear out of the circle after you land. It makes it a lot easier for the other flier if he doesn't have to play leap frog trying to find a place to set his ship down, especially when you fly five at a time.

This is a typical show:

1—two "60's" fly 100' ribbons, this gives both fliers a chance at the same time.
2—one scale C-119.
3—three "35's" ribbon cutting.
4—two "60" biplanes in dual stunting.
5—four "60's" balloon busting (balloon tied on ship with 15' leader).
6—one scale B-25, two 60's making passes.
7—one 6' plane pulling a 40' ribbon and three or four "29's" trying to cut it off a piece at a time.
8—two "60" biplanes and two "60" monoplanes, ribbon cutting.
9—one scale autogyro or flying saucer.
10—five "60" biplanes in a team race with three refueling stops.

These ten scheduled flights actually make 39 individual flights. It is usually less than three minutes from the time the last ship in the preceding flight lands and the next flight is airborne. This is why the fliers have to really know their engines. They should start with less than four flips of the prop, hot or cold.

When we started out as sport fliers (six years ago), Jim Losie developed the biplane and I the *Joker*. The fliers that originally helped to put the circus over are Jim Losie, E. J. Losie, Ray Brennan, Ken Taylor, Harry Foucher, Nelson Farley, Bob Upton, and many others who have since been added. END

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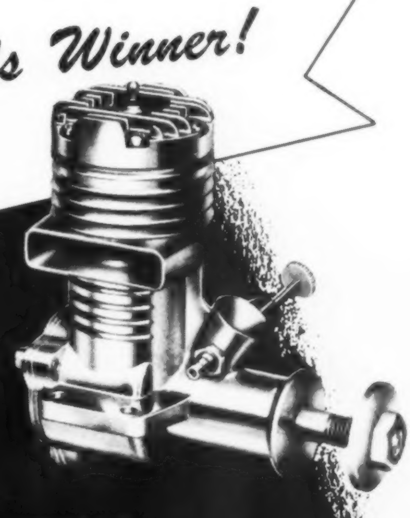

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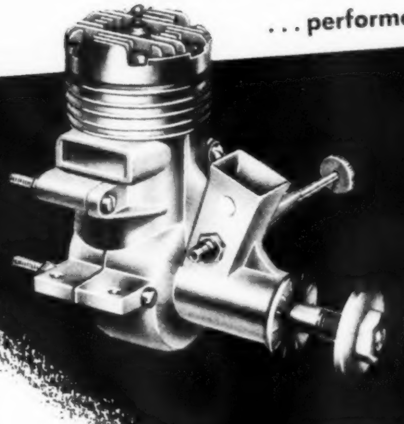

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